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A DISCUSSION OF MIKULICZ' DISEASE, WITH REPORT OF A CASE OF LYMPHATIC LEUKEMIA IN A CHILD WITH MARKED ENLARGEMENT OF THE SALIVARY GLANDS

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In the year 1892 Mikulicz[1] described a new disease, characterized by chronic, bilateral, painless enlargement of the lacrimal and salivary glands. In the cases which formed the basis of his report the blood was normal and there was no involvement of the lymph-nodes or spleen. The histologic picture resembled that of a lymphoma. There was no tendency to recurrence after complete extirpation. Mikulicz considered the disease to be due to some inflammatory agent of unknown nature.

Since then, however, cases have been reported in which pseudoleukemia or leukemia was accompanied by a similar enlargement of the lacrimal and salivary glands, and v. Brunn[2] in 1905 was able to collect a series showing all gradations from the syndrome described by Mikulicz to pseudoleukemia and leukemia. The association with the last-named disease, however, is so rare that the following case seems worthy of record.

Lymphatic leukemia of the "aleukemic" type, in a child 2 years old; large tumors of both parotid and both submaxillary glands, lacrimal glands not involved; autopsy.

History.—G. H., born Oct. 13, 1903, entered the Children's Hospital, Boston, Aug. 30, 1905. The baby was well till April, 1905, when she had fever, ranging from 103 to 105 F., for a period of three or four weeks. About three weeks after the temperature became normal, the parotid glands began to swell. Tincture of iodin applied over the glands caused them to decrease in size until they were scarcely noticeable by August 1, but the swelling soon returned. Bunches in the neck appeared three months prior to admission. There had been diarrhea, off and on, for two months previous to admission. I saw the child in the outpatient department of the Children's Hospital, and sent her into the hospital in the service of Dr. J. L. Morse, to whom I owe thanks for the privilege of reporting the case.[3]

Physical Examination.—The child was well developed and nourished and only slightly pale, and weighed 26¼ pounds. The appearance of the face was striking,

1. Mikulicz, J.: Beitr. z. Chir. Festschr. (Billroth), 1892, 610.

2. Von Brunn, M.: Beitr. z. klin. Chir., 1905, xlv, 225.

3. This case has been reported in brief by Dr. J. L. Morse: "The Anemias of Infancy," Jour. Am. Med. Assn., 1909, lii, 455, Case 17. (For the earlier history I am indebted to Dr. J. W. Clarke of Attleboro.)

resembling a very marked case of mumps. Palpation revealed a hard swelling of both parotid glands, about the size of hens' eggs. The skin over the tumors was not reddened nor adherent, there was no pain and no tenderness on pressure. A short distance in front of the parotid on each side was a hard mass the size of a marble. (Accessory parotid glands.) Both submaxillary glands showed similar swellings the size of walnuts. The lacrimal and sublingual glands were not enlarged. There was no exophthalmos. The tonsils were considerably increased in size, but without exudate or ulceration. The lymph-nodes in the neck, axillæ and groins were considerably enlarged. The examination of the chest was negative except for slight dulness over the upper part of the sternum. The liver reached from the fifth rib to 5 cm. below the costal margin in the nipple line; the surface was smooth and the edge hard and sharp. The spleen was much enlarged, reaching from the sixth rib to 5 cm. below the costal margin, the long diameter being 12.5 cm. On the outer side of the leg were several small ecchymoses. There was no edema and the signs of rickets were absent.

Urine: Acid; no albumin, sugar or casts, but many leukocytes.

Blood: August 30, red cells, 6,860,000; hemoglobin, 95 per cent., leukocytes, 14,700; small mononuclears, 50 per cent.; large mononuclears, 23 per cent.; polynuclear neutrophils, 25 per cent.; eosinophils, 1 per cent.; basophils, 1 per cent.; no poikilocytosis and no nucleated red cells. September 1, red cells, 6,188,000. September 12, leukocytes, 11,500; small mononuclears, 51 per cent.; large mononuclears, 26 per cent.; polynuclear neutrophils, 21 per cent.; basophils 2 per cent. September 14, leukocytes, 6,700; small mononuclears, 23 per cent.; large mononuclears, 41 per cent.; polynuclear neutrophils, 36 per cent. The child was in very fair condition, with a slight fever, till September 14, when the temperature suddenly rose to 106 F., and she died the next day.

Autopsy.—(Dr. C. W. Duval.) There were dull purple spots on the thighs, upper arms and forehead, averaging 5 cm. in diameter. The parotid and submaxillary glands were much enlarged and firm. The cervical, mediastinal and mesentery lymph-nodes were considerably enlarged, ranging in size from that of peas to hazel-nuts. The thymus gland was greatly enlarged, measuring 8 cm. in its long diameter. The heart and lungs were not remarkable. The spleen was very large, measuring 18 by 7.5 cm.; it was firm and purplish red, and on section showed small grayish-white areas the size of a pinhead or less. The liver was enlarged and smooth and rather soft; on section mottled grayish-yellow and light red. The gastro-intestinal tract was normal. The kidneys were large, the capsule greatly thickened and showing considerable hemorrhage on its inner surface. On section the cortex was yellowish-white with many small hemorrhagic areas. Scharlach R showed a moderate amount of fat in the convoluted tubules.

Microscopic Examination.—(W. Tileston.) All sections were stained with eosin and methylene blue.

Salivary Glands: The parotid and the submaxillary glands presented identical appearances. The acini were widely separated by dense masses of cells of the lymphocytic series, which will be alluded to hereafter as lymphoid cells. The secretory cells appeared normal, except that they were crowded together so that no lumen was visible, suggesting compression. In places, especially near the capsule, there was a diffuse infiltration with lymphoid cells, and no gland cells were seen. The capsule was thickly infiltrated with lymphoid cells. The connective tissue septa appeared increased in thickness, but were poor in cells.

Lymph Nodes: Sections of three lymph-nodes all showed similar changes. There was a general overgrowth of lymphoid cells, obscuring the normal structure. Only a very few normal follicles could be found. There was a considerable number of large cells with pale pink protoplasm and large vesicular nuclei (endothelial cells). One section showed infiltration of the adjacent fat tissue with lymphoid cells.

Bone Marrow: The bone marrow of the sternum showed lymphoid infiltration. Further details are not available because the section was lost before it was carefully studied.

Thymus Gland: The thymus showed a general overgrowth of lymphoid cells. Hassal's corpuscles were apparently diminished in number.

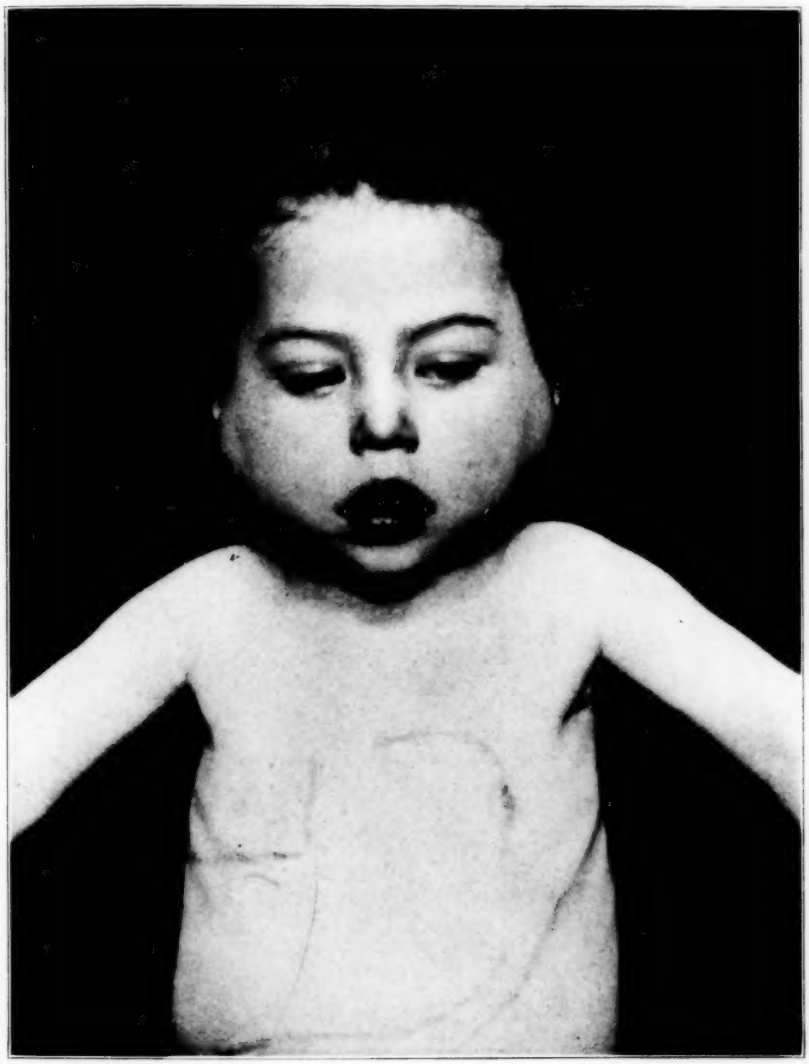

Fig. 1.—Photograph of author's case, showing the enlargement of the parotid and submaxillary glands.

Liver: The liver presented a remarkable degree of infiltration with lymphoid cells, involving the whole organ, but most marked about the portal vessels. This infiltration was mostly diffuse, but in places, especially in the portal spaces, there were large foci of lymphoid cells. Here and there a clump of these cells might be seen to lift up the endothelium of a central vein. In some places a blood-

vessel was clearly separated by an endothelial wall from a mass of lymphoid cells; the latter, therefore, as Dr. Mallory pointed out to me, were situated in a lymph-sinus. The parenchymal cells were normal, except for some compression and atrophy.

Spleen: There was a striking infiltration with lymphoid cells along the larger vessels and next to the trabeculæ; the blood-sinuses were engorged with red cells. The follicles were enlarged, and some of them showed proliferation of endothelial cells at the center.

Kidneys: There was a high grade of lymphoid infiltration, both diffuse and circumscribed. A broad band of tissue in the cortex showed no trace of parenchyma, nothing but lymphoid cells, with a reticulum of fine connective tissue with capillaries. Elsewhere in the cortex there were strips of infiltration about the vessels, and parallel to the straight tubules, which were shoved widely apart. The parenchyma appeared normal.

The lungs, heart, stomach, intestine, ovary and urinary bladder all showed a moderate infiltration with lymphoid cells. The adrenal gland was normal.

The histologic picture was so typical that Dr. Mallory made the diagnosis of lymphatic leukemia without hesitation. There can be little question that this case should be classified as lymphatic leukemia of the "aleukemic" or "preleukemic" type; that is to say, without increase in the leukocyte count. The histologic appearance of the salivary glands, however, is identical with that described in many cases of Mikulicz' disease without involvement of the blood or lymphatic system, so that the case also fits in with the Mikulicz syndrome. The absence of enlargement of the lacrimal glands does not preclude such a classification, for although in the *typical* cases of Mikulicz' disease the lacrimals are involved, a number of instances have been reported in which they were not.

A search of the literature shows that the association of leukemia with the Mikulicz syndrome is extremely rare, only eight cases having or leukemia (eight out of twelve). The preponderance of females over males (eight out of twelve) may well be due to chance. Reuss[4] has reported four cases of chronic relapsing parotitis in children, in which both sides were affected, but which differed from Mikulicz' disease in that there were acute exacerbations of an inflammatory character.

MIKULICZ' DISEASE IN CHILDREN

Up to the present time twelve cases of children showing the Mikulicz syndrome have been reported. The only striking difference from the disease as seen in adults is the large proportion with pseudoleukemia or leukemia (eight out of twelve). The preponderance of females over males (eight out of twelve) may well be due to chance. Reuss[4] has reported four cases of chronic relapsing parotitis in children, in which both sides were affected, but which differed from Mikulicz' disease in that there were acute exacerbations of an inflammatory character.

4. Von Reuss, A.: Jahrb. f. Kinderh., 1909, lxx, 161.

CLASSIFICATION

The cases reported as Mikulicz' disease may be divided into three main groups as follows: 1. Those with involvement of the lacrimal and salivary glands in various combinations, but without changes in the blood, lymph-nodes or spleen; this is the Mikulicz' disease *par excellence*. 2. Those with enlargement of the lymph-nodes or spleen, or both. 3. Those with leukemia.

Fig. 2.—Photomicrograph of parotid gland, high power, showing acini and infiltration with lymphoid cells.

The first two groups are represented by numerous examples, while the third is a rare condition. Some of the cases in group two are probably to be considered as belonging to pseudoleukemia, especially those with very large spleens, with skin nodules, and with lymphomata in the intestine (Butterfield's case).[5]

5. Butterfield, E. E.: Physician and Surg., Detroit, 1907, xxix, 49.

ETIOLOGY

It is evident to anyone who studies the literature carefully that several different conditions have been described as Mikulicz' disease. Those cases showing leukemia or pseudoleukemia may be eliminated at once; they are simply unusual locations of the lymphomata common to these diseases. It should be emphasized, however, that a number of cases have been classed as pseudoleukemia without sufficient evidence; in many of them it is simply stated that the spleen and the lymph-nodes were increased in size, without mentioning the degree of the enlargement. Yet a moderate degree of enlargement of these structures is often met with in most of the chronic infectious diseases. The frequency of recovery in these cases (in Fleischer's[6] Case 1 the patient was well eight years later) is quite against the diagnosis of pseudoleukemia. One can find comparatively few out of the many cases with enlarged spleen and lymph-nodes in which the diagnosis of pseudoleukemia will bear a strict critique.

The interesting cases of simple hypertrophy of the salivary glands should also be excluded. This is a rare condition, described hitherto only by French observers. In two such cases (Jayle[7] and Frenkel[8]) tissue removed by incision showed normal structure. Apert's[9] case of dwarf growth in a man with enlargement of the parotids and breasts and glycosuria probably belongs in this class.

After these limitations there remains a considerable number of cases to which the term Mikulicz' disease may be more properly applied. They present the following features: chronic, painless and symmetrical enlargement of the salivary glands or lacrimal glands, or both, with or without moderate enlargement of the spleen and lymph-nodes; a benign course with no tendency to recurrence after complete extirpation of the affected glands; frequent cure under the use of arsenic, iodids or the *x*-ray, sometimes spontaneously.

For a part of the cases of Mikulicz' disease in this stricter sense, tuberculosis is the probable cause, as has been shown by Fleischer.[6] This observer reported four such cases, in two of which typical tubercles were found in the excised glands. The diagnosis was confirmed by Baumgarten. In one of these two the swellings of the salivary and lacrimal glands and a tuberculous iritis disappeared during a tuberculin cure. In none of the patients, however, were tubercle bacilli found in the glands. In Napp's[10] case, which was in other respects typical, miliary

6. Fleischer, B.: Klin. Monatsbl. f. Augenh., 1910, xlviii, 289.
7. Jayle: Bull. Soc. anat. d. Paris, 1894, 5 S. viii, 120.
8. Frenkel, H.: Arch. med. de Toulouse, 1909, xvi, 73.
9. Apert, E.: Bull. et. mém. Soc. méd. d. hôp de Paris, 1908, xxv, 155.
10. Napp, O.: Ztschr. f. Augenh., 1907, xvii, 513.

tubercles with caseation and tubercle bacilli were found in a bit of the conjunctiva which was excised. The ultimate proof, the demonstration of tubercle bacilli in the salivary or lacrimal glands themselves, still remains to be furnished, and it is possible that some cases taken to be tuberculosis were in reality instances of Hodgkin's disease of the Fischer-Reed type, which notoriously resembles tuberculosis.

Syphilis could be excluded in most cases and was the probable cause in only one, that of Gutmann,[11] in which a typical Mikulicz syndrome occurred three years after infection in a man who had previously shown the eruption of secondary syphilis; the administration of potassium iodid was followed by a cure, but no certain proof of the syphilitic nature of the Mikulicz syndrome was adduced.

For the remaining cases the etiology is obscure. The most likely cause seems to be some infectious agent in the widest sense of the word, as Mikulicz himself assumed. The possible modes of entrance are two-fold; either by the ducts or by the blood current. In favor of the former are the facts that the lacrimal glands are almost always involved first, and that in many instances there has been a previous or coincident inflammation of the conjunctiva. In favor of infection by the blood current is the bilateral character of the affection.

PATHOLOGIC ANATOMY AND HISTOLOGY

The affected glands are uniformly enlarged and hard, the normal markings lost. Microscopically two types may be distinguished: (1) the lymphomatous, in which the acini are pushed apart by dense masses of cells of the lymphoid series, and (2) the chronic inflammatory, in which in addition to lymphocytes there are granulation tissue, endothelial cells, often giant cells and eosinophils. The first type is somewhat the more common; the second includes cases which may have been tuberculosis, or possibly Hodgkin's disease.

THE SYMPTOMATOLOGY

There remains little to be added to what has been said already. Besides the glands already mentioned there is frequently involvement of other glands related to the lacrimal-salivary system, such as the accessory lacrimals, Krause's glands in the upper eye-lid, the Nuhn gland on the under surface of the tip of the tongue, and sometimes the mucous glands of the mouth. There are sometimes small nodules in the conjunctiva. There may be disturbance of the function of the affected glands, usually in the form of diminished secretion, so that the mouth is dry and the shedding of tears is impossible. In many cases, however,

11. Gutmann: Berl. klin. Wchn-schr., 1907, xliv, 1141.

the function has not been interfered with. The general health is not impaired, except in those cases associated with pseudoleukemia or leukemia, and symptoms of inflammation are conspicuous by their absence.

DIFFERENTIAL DIAGNOSIS

The diagnosis of those cases showing the complete syndrome is easy. Mikulicz' disease is distinguished from *lymphosarcoma* by the more chronic course and by the (usual) absence of swelling of the regional lymph-nodes; from *primary tumors* by the fact that both sides are involved; from *pseudoleukemia* and *leukemia* by the course of the disease and the examination of the blood. From *chronic relapsing parotitis* it is differentiated by the absence of symptoms of inflammation, and from *simple hypertrophy* by the histologic appearances, and the presence of enlargement of the lacrimal glands. The fact that plumbism and iodism may occasionally cause parotid swellings should be borne in mind; also the occasional persistence for a few months of the swelling due to mumps. The *acute* Mikulicz syndrome described by Snegireff[12] only lasts a few days or weeks, and hence leads to no difficulty.

PROGNOSIS

The prognosis as to life is good in the cases not complicated with leukemia or pseudoleukemia. These latter diseases, however, can be excluded only by observation of the patient and repeated blood examinations, so that the prognosis should be guarded at first. A disappearance of the glandular swellings is likely to occur under treatment, but rarely spontaneously. During the course of acute infectious diseases a diminution of the size of the glands has been noted frequently, but it is followed by an increase to the former size.

TREATMENT

In a number of cases, the use of potassium iodid or arsenic has been followed by recovery. When these were ineffectual, exposure to the *x*-ray has in all the reported cases (Pfeiffer,[13] Haenisch,[14] Ranzi,[15] Fittig[16]) led to a disappearance of the swellings; relapses occurred in Pfeiffer's case, but were readily overcome by further *x*-ray treatment. Histologic studies by Pfeiffer showed that the *x*-ray exposures caused a disappearance of the lymphoid tissue, which was replaced by fibrous connective tissue, as occurs on exposure of *normal* lymphoid tissue to these rays.

12. Snegireff, K. W.: Klin. Monatsbl. f. Augenh., 1906, xliv,[2] 245.
13. Pfeiffer, C.: Beitr. z. klin. Chir., 1906, l, 145.
14. Haenisch, F.: Fortschr. a. d. Geb. d. Röntgenstrahlen, 1906-7, x, 291.
15. Ranzi, E.: Mitt. a. d. Grenzgeb. d. med. Chir., 1906, xvi, 554.
16. Fittig: Allg. med. Centr-Ztg., 1904, lxxiii, 606.

Complete extirpation of the glands is not followed by recurrence, but it is out of the question in the case of parotid on account of the certainty of damage to the facial nerve.

CONCLUSIONS

1. The term Mikulicz' disease should be reserved for those cases of chronic, painless bilateral enlargement of the salivary and lacrimal glands in which pseudoleukemia and leukemia can be excluded.

2. The cases occurring in the last-named diseases should be classified as pseudoleukemia or leukemia with the Mikulicz syndrome.

3. The cause of Mikulicz' disease is probably some infectious agent in the widest sense of the word. It is likely that a number of different organisms may cause the symptoms of the disease.

For the bibliography the reader is referred to a recent article by C. P. Howard.[17] This writer, however, includes some cases which hardly belong in this category; e. g., cases of simple hypertrophy of the parotid gland and cases of unilateral involvement of a single gland.

I am indebted to Prof. F. B. Mallory for valuable assistance in the histologic work.

308 Crown Street.

REFERENCES

In addition to those numbered in the text the following references are given:
Cases of Mikulicz Syndrome in Leukemia.
Bäch, S.: (Case 1), Ztschr. f. Augenh., 1899, i, 234.
Dunn, T. D.: Tr. Coll. Phys., Phila., 1893, xv, 103.
Gallasch, F.: Jahrb. f. Kinderh., 1874, vii, 82.
Kerschbaumer, R.: Arch. f. Ophth., 1895, xli, 99.
Senator, H.: Berl. klin. Wchnschr., 1907, xliv, 965.
Stock (Case Lorenz), klin. Monatsbl. f. Augenh., 1906, N. F., i, 328.
Tileston's case.
Cases of Mikulicz' Disease or Syndrome in Children.
Dunn, J.: Arch. Ophth., 1907, xxxvi, 52.
Haltenhoff: Ann. d'ocul., 1889, cii, 110.
Marcuse, P.: Berl. klin. Wchnschr., 1904, xli, 1205.
Meller, J.: (Case II), Klin. Monatsbl. f. Augenh., 1906, xliv, 177.
Osler, W.: Amer. Jour. Med. Sc., 1898, cxv, 27.

17. Howard, C. P.: Internat. Clin., 1909, 19 S., i, 30.

A STUDY OF THE CALORIC NEEDS OF PREMATURE INFANTS

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The purpose of this paper is not to go into the details of the care and treatment of premature infants. It is rather to give such practical points and conclusions as have been arrived at after a study of the histories and development of the present series of seventeen cases, which have been selected, not because of their being ideal cases, but because they presented the different phases illustrated by proper under- and overfeeding as estimated by the caloric standard for nutritional needs as suggested by Budin, L. F. Meyer and others. The infants under discus-

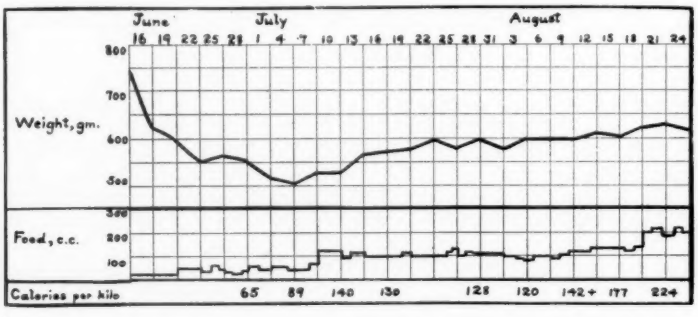

Chart 1.—Weight and food curves and calories per pound weight in Case 1. The patient entered June 16, 1916, aged 1 day; weight 740 gm.; condition bad; died Aug. 27, 1916; aged 75 days; weight 615 gm.

sion were fed rather according to the scale, with more especial attention to the temperature, stools, abdominal distention, cyanosis and general symptomatology, and only later their records were reviewed to ascertain the caloric intake. All except Infants 1 and 2 left the hospital in good health at the end of the period tabulated.

The infants have all been fed human milk exclusively while under my care. Those too weak to nurse have been catheter-fed or the Breck feeder has been used, while in those nursing, the milk taken has been estimated by weighing before and after feeding. The cases have been classified according to weight into those weighing under 1,000 gm., those between 1,000 and 1,500, and those over 1,500 gm.

Cases 1 and 2.—Martha and Augusta were twins, born of a Greek family at 6½ months, and were delivered by a midwife. The mother visited the children at the hospital on the fourth day after their birth and on the following, the fifth

day, gave birth to a third, still-born fetus with a second placenta, and was again out on the ninth day. No less interesting were some of the deformities in the case of Baby Martha of this interesting group of triplets. She had but two fingers on one hand, and both knees and elbows were ankylosed in extension; in fact, there seemed to be an absence of the joint surfaces; while Baby Augusta had freedom of motion in all of her joints. Considering their prematurity, 6½ months, their weight at birth, 740 and 690 gm., respectively, together with the deformities in Baby Martha, it is surprising to find them surviving to 72 and 71 days, when both succumbed during attacks of cyanosis, due in all probability to over-feeding.

Because of Baby Augusta's better development, she was fed greater quantities from the start and although she did not have as great an initial fall in weight,

Photograph of twins, Cases 1 and 2.

both continued to lose until the twentieth day, Baby Augusta losing a total of 200 gm. and Baby Martha 230 gm. in this time. The records are rather incomplete as to the food given in Case 2 during this period. In Case 1, the estimates run from 65 to 89 calories per kilo. From the twentieth day on both infants showed almost stationary weight with food values below 120 and the greatest gain on an energy quotient[1] between 130 and 140; and death in both cases with an energy quotient of over 200.

CASE 3.—Baby Ethna, with a birth-weight of 1,360 gm., showed a steady increase after 137 was reached and continued to grow steadily until 220 was

1. Energy quotients were calculated by measuring the total quantity of human milk (in liters) fed in twenty-four hours and multiplyinig by 700 (caloric value of 1 liter of human milk) and dividing by the infant's weight (in kilograms).

passed, although the growth averaged only 12 gm. daily, being lower than several infants fed with a much lower energy quotient.

CASE 4.—Baby George, birth-weight 1,335 gm., had an average daily gain of 14 gm. with an average energy quotient between 95 and 161.

CASE 5.—Baby Hattie, birth-weight 1,435 gm., showed a daily gain of 17 gm. on an energy quotient of 116 to 148.

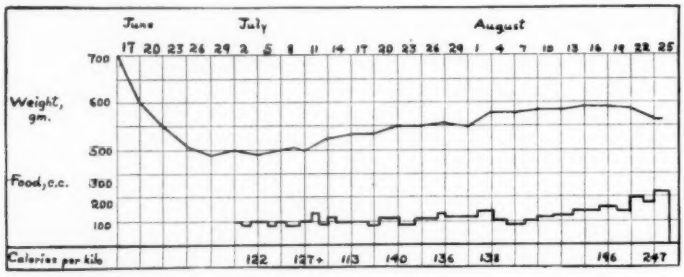

Chart 2.—Weight and food curves and calories per pound weight in Case 2. The patient entered June 17, 1910, aged 1 day; weight 690 gm.; condition bad; died Aug. 26, 1910; aged 74 days; weight 565 gm.

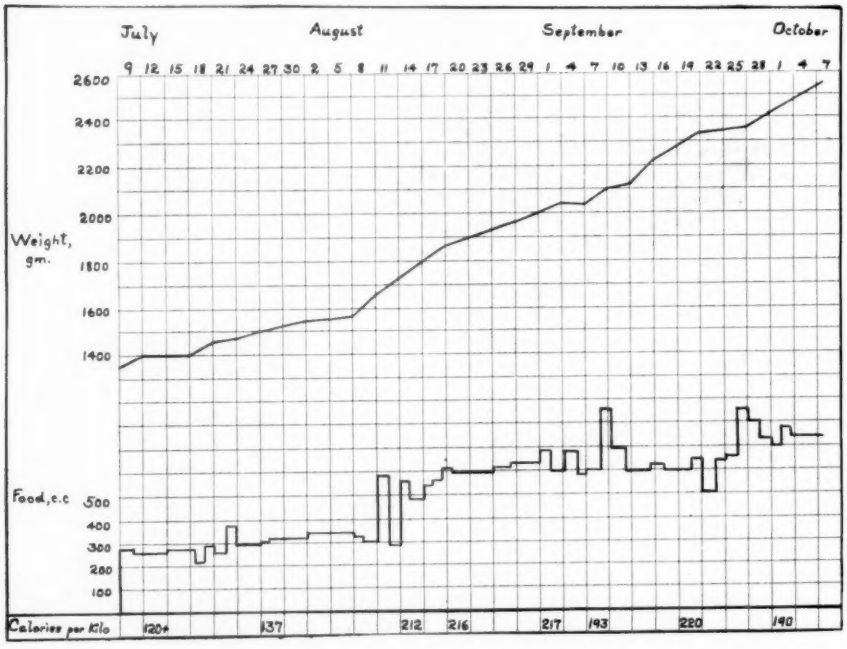

Chart 3.—Showing weight and food curves and calories per pound weight in Case 3. The patient entered the hospital, July 9, 1907, aged one day; weight 1,360 gm.; condition fair; discharged Oct. 5, 1907; aged 88 days; weight 2,512 gm.; condition good.

CASE 6.—Baby Nell-Helen, birth-weight 1,420 gm., showed an average daily gain of 27 gm. on an energy quotient of 115 to 144; the curve being more regular as the latter figure was approached.

CASE 7.—Baby Juanita, birth-weight 1,070 gm., has an ideal curve with an energy quotient ranging between 132 and 170, and an average daily gain of 14 gm. over a period of ninety days.

CASE 8.—Baby Grace, with a birth-weight of 1,440 gm., showed initial gain on 102 calories, followed by a loss when the same was reduced below 100; followed by a gain at 100, and a steady loss at 91; a moderate gain at 109; the loss was

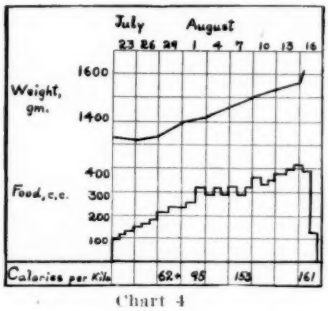

Chart 4

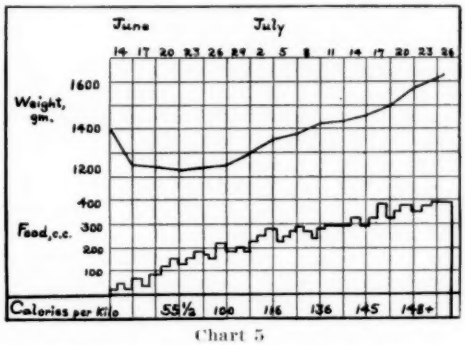

Chart 5

Chart 4.—Weight and food curves and calories per pound weight in Case 4. The patient entered July 23, 1910, aged one day; weight 1,335 gm.; condition fair; discharged Aug. 16, 1910; aged 24 days; weight 1,625 gm.; condition good.

Chart 5.—Weight and food curves and calories per pound weight in Case 5. The patient entered June 14, 1910, aged one day; weight 1,435 gm.; condition fair; discharged July 27, 1910; aged 43 days; weight 1,650 gm.; condition good.

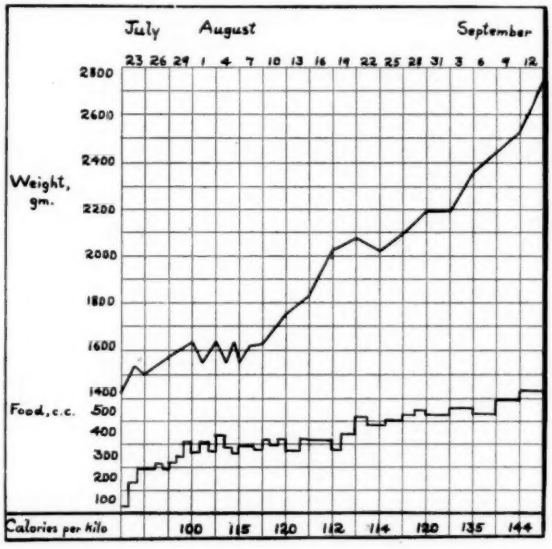

Chart 6.—Weight and food curves and calories per pound weight in Case 6. The patient entered July 23, 1907, aged one day; weight 1,420 gm.; condition fair; discharged Sept. 18, 1907; aged 57 days; weight 2,960 gm.; condition good.

again repeated at 90.5 and was followed by a rapid gain at 130 to 137, averaging daily 24.5 gm., and a less rapid growth, with greater fluctuations, at 115 to 109.5, averaging 10 gm. daily, and again rapidly rising with 124.

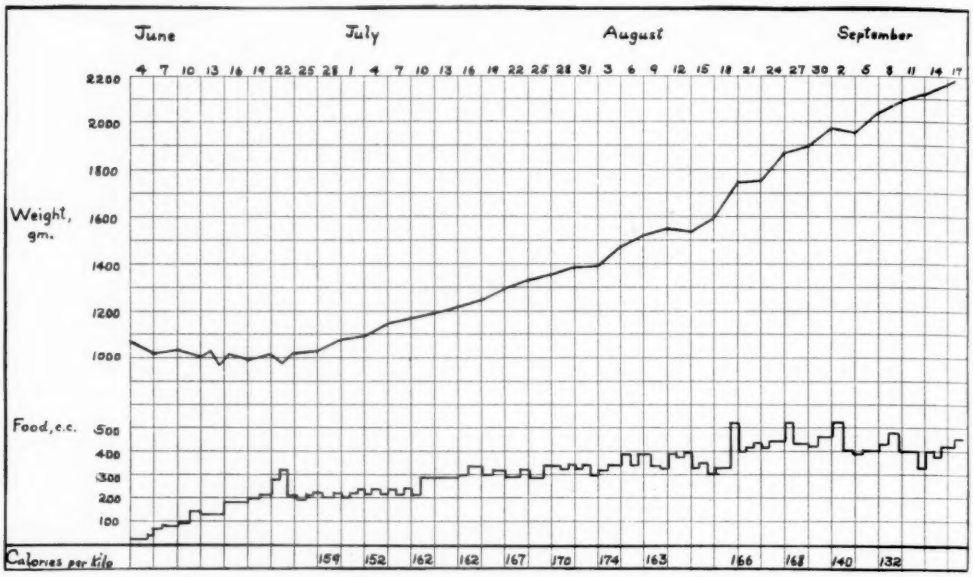

Chart 7.—Weight and food curves and calories per pound weight in Case 7. The patient entered June 4, 1910, aged one day; weight 1,070 gm.; condition fair; discharged Sept. 18, 1910; aged 105 days; weight 2,180 gm.; condition good.

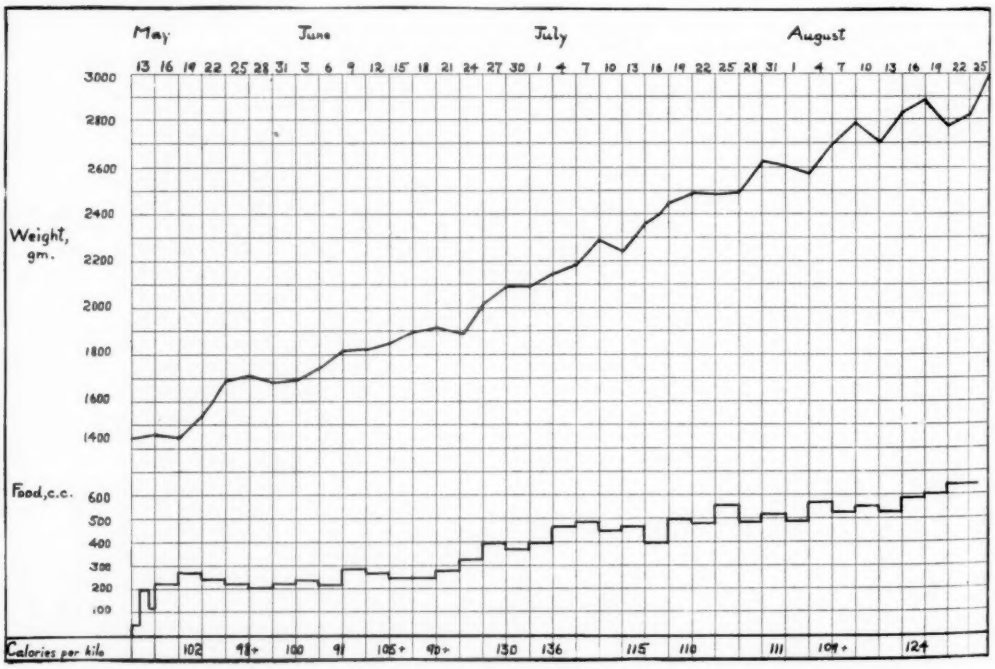

Chart 8.—Weight and food curves and calories per pound weight in Case 8. The patient entered May 13, 1907, aged 1 day; weight 1,440 gm.; condition fair; discharged Aug. 27, 1907; aged 106 days; weight 2,960 gm.; condition good.

In infants weighing between 1,500 and 2,000 gm. at birth, however, there is a more certain tendency to gain steadily at an energy quotient nearer 160. The ability of an infant to adapt itself to higher food values is beautifully illustrated in Case 9, Baby George, who gained steadily with only slight fluctuations on values gradually increased to 169.

CASE 10.—Baby Stella showed the most ideal curve with an average daily gain of 37 gm., gaining 1,130 gm. in one month on an energy quotient gradually increased from 105 to 131.

CASE 11.—Baby Marie first showed a gain at 104, continuing to gain on 102 and 119, but far less rapidly than Case 10, with its higher quotient, averaging only 21.5 gm. daily.

CASE 12.—Baby Martin Jo had a steady gain, averaging daily 18 on an energy quotient of 127 to 170, with an average daily gain of 9.5 on an energy quotient

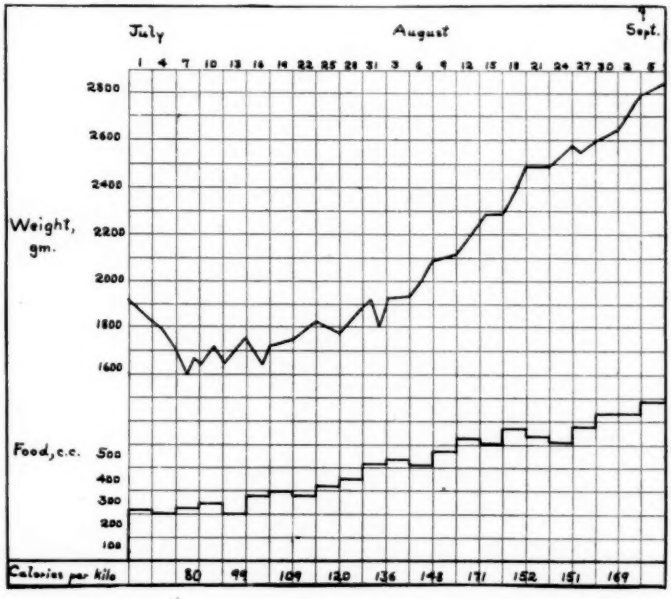

Chart 9.—Weight and food curves and calories per pound weight in Case 9. The patient entered July 1, 1907, aged 1 day; weight 1,935 gm.; condition fair; discharged Sept. 8, 1907; aged 69 days; weight 2,835 gm.; condition good.

between 170 and 206, associated with marked fluctuations and a tendency towards disturbed metabolic balance.

CASE 13.—Baby Jim shares with Case 10 the laurels of steady gain, and as in Case 10, the energy quotient is relatively low and the fluctuations small, averaging between 111 and 120, with an average daily gain of 40 gm.

CASE 14.—Baby Mike also presented a steady curve on an energy quotient ranging from 94.5 to 118.5. He was the largest child and, as is the rule, the larger the infant the smaller the energy quotient needed for increasing weight, the average being 43 gm. gained per day.

CASE 15.—Baby Marie, a smaller infant, showed her best gain at 125, with marked fluctuations in weight below 100.

CASE 16.—Baby Edythe showed another steady curve with regular gain with the energy quotient between 164.5 and 120, averaging 23 gm. daily increase.

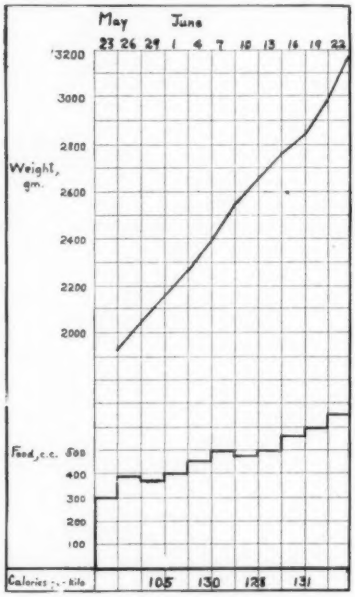

Chart 10

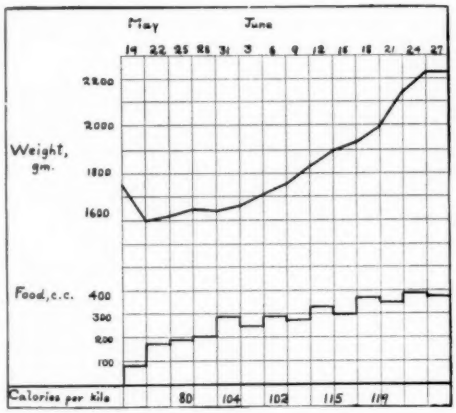

Chart 11

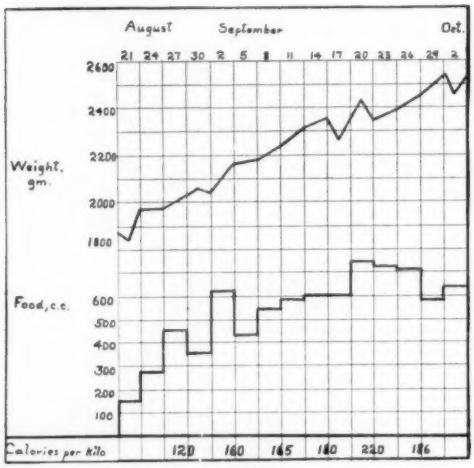

Chart 12

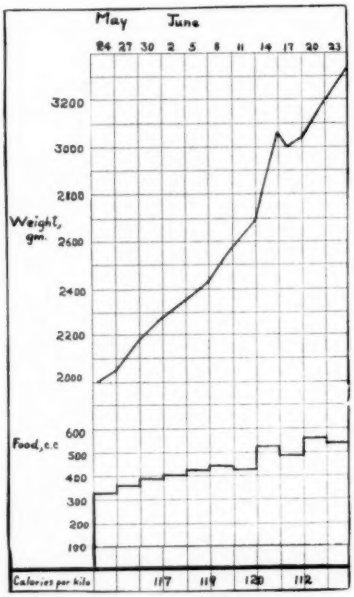

Chart 13

Chart 10.—Weight and food curves and calories per pound weight in Case 10. The patient entered May 23, 1909, aged 1 day; weight 1,930 gm.; condition fair; discharged June 22, 1909; aged 30 days; weight 3,160 gm.; condition good.

Chart 11.—Weight and food curves and calories per pound weight in Case 11. The patient entered May 19, 1910, aged 1 day; weight 1,750 gm.; condition fair; discharged June 28, 1910; aged 40 days; weight 2,225 gm.; condition good.

Chart 12.—Weight and food curves and calories per pound weight in Case 12. The patient entered Aug. 21, 1907, aged 1 day; weight 1,890 gm.; condition fair; discharged Oct. 5, 1907; aged 45 days; weight 2,515 gm.; condition good.

Chart 13.—Weight and food curves and calories per pound weight in Case 13. The patient entered May 24, 1909, aged 1 day; weight 1,950 gm.; condition fair; discharged June 26, 1909; aged 33 days; weight 3,315 gm.; condition good.

CASE 17.—Baby Josephine, although one of the largest in the series, weighing 1,960 gm. at birth, showed a loss of weight at 60.5, a minimum gain at 88.5 and a rapid gain between 105 and 132, averaging 25 gm. daily.

DEDUCTIONS

1. The twins, weighing, respectively, 740 and 690 gm. at birth, showed regular gains in weight when the energy quotient averaged between 120 and 170; when 200 was passed death followed in both infants.

2. In a study of six infants with a birth-weight averaging between 1,000 and 1,500 gm., we find four infants with energy quotients fluctu-

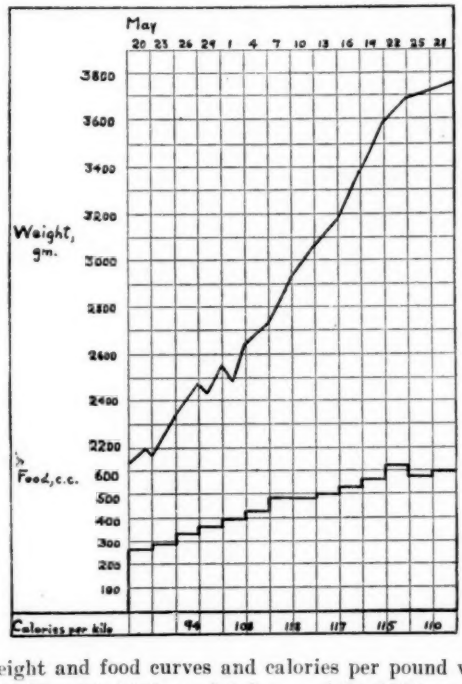

Chart 14.—Weight and food curves and calories per pound weight in Case 14. The patient entered May 20, 1909, aged 1 day; weight 2,010 gm.; condition good; discharged June 29, 1909; aged 40 days; weight 3,775 gm.; condition good.

ating between 115 and 170, averaging daily gains between 14 and 27 gm., while those with wider fluctuation, Cases 3 and 4, gained on an average 12 to 14 gm. daily.

3. Infants with birth-weights between 1,500 and 2,000 gm. showed the best results when being fed between 102 and 132. The largest infant with a birth-weight of 2,010 gm. gained on 94.5 to 118.5 apparently with equal rapidity, while Infant 12 showed marked fluctuations when an energy quotient was passed.

CONCLUSIONS

In conclusion it is safe to state that the figures of Budin and others, of an energy quotient of 100 set for the full-term new-born infant, does not hold for the premature and under-weight infant, but I would say that the energy quotient needed, varies inversely with the age and birth-

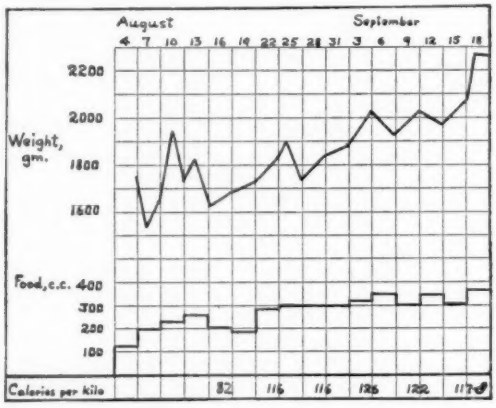

Chart 15.—Weight and food curves and calories per pound weight in Case 15. The patient entered Aug. 1, 1907, aged 1 day; weight 1,765 gm.; condition fair; discharged Sept. 18, 1907; aged 49 days; weight 2,120 gm.; condition good.

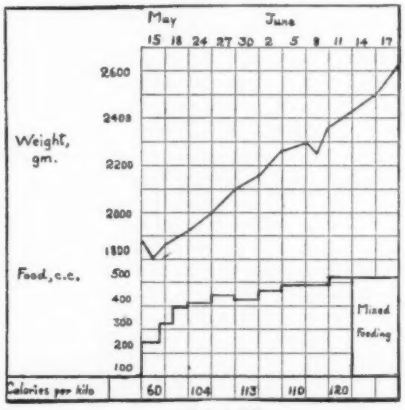

Chart 16

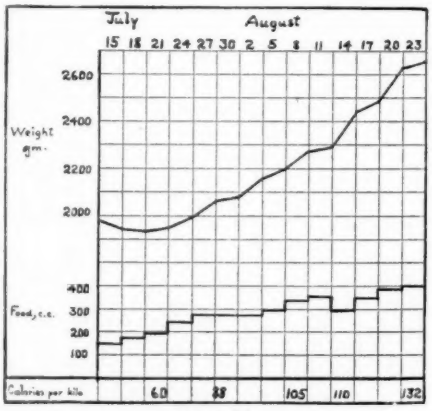

Chart 17

Chart 16.—Weight and food curves and calories per pound weight in Case 16. The patient entered May 15, 1910, aged 1 day; weight 1,875 gm.; condition fair; discharged June 16, 1910; aged 32 days; weight 2,615 gm.; condition good.

Chart 17.—Weight and food curves and calories per pound weight in Case 17. The patient entered July 15, 1907, aged 1 day; weight 1,960 gm.; condition fair; discharged Aug. 23, 1907; aged 39 days; weight 2,635 gm.; condition good.

weight, the energy quotient averaging between 115 and 170 in those below 1,500 gm. and 100 and 132 in those over 1,500 gm. These figures are not arbitrary, and, of all things, should not lead to an attempt to feed

these values in the first few days of life; otherwise a catastrophe will result. At first not only should the caloric value of the food be low, but the quantity of each feeding should also be small.

1. These infants, therefore, should be fed small quantities, frequently repeated, i.e., every one and one-half to two hours during the day and two to three hours during the night, according to the development of the individual, with special reference to the digestive organs, stools, urine and presence or absence of vomiting.

2. On the first day following the first bowel evacuation the human milk may be fed diluted with one or two parts of water or sugar, with a caloric value approximating 30.

3. From the second day on, in the absence of indigestion, the food may be increased by 10 calories daily. In the presence of digestive disorders greater care is necessary and it may be necessary for some days to hold the feeding in the neighborhood of 90, approximately the amount necessary to maintain the metabolic equilibrium.

4. After ten to fifteen days an attempt should be made to hold the figures, in the infant weighing less than 1,500 gm., to 120 to 140, and in those weighing over 1,500 gm. at between 110 and 130; but in all cases the infant itself should never be lost sight of, and more especially the stools and weight.

Budin's rule for the total twenty-four-hour quantity of milk to be given is very practical and is as follows: Feed one-fifth of the body-weight of the infant, or multiply the infant's weight by two and feed one-tenth of this amount. Budin used 650 calories to a liter of human milk as the basis for his estimation of the energy quotient, while in the figures I have given, I have figured the same as having a caloric value of 700, which would give an energy quotient of 10 higher with the latter; i. e., 130 with 650 as compared with 140 with 700 as a working basis.

5. Higher caloric needs of the premature are due to two factors — larger body surface proportionate to size and the consequent increased metabolic requirements. The early results quoted in my cases were obtained in infants raised in incubators, some of the later by the use of electric pads. It is quite necessary that all be provided with artificial heat whether from incubators, electric pads or hot water bottles, sufficient heating being used to cause the temperature to approach the normal. In incubators this ranges from 78 to 90 F. All of these methods are fraught with danger, and I have seen a temperature of 106 F. in an infant which was too close to the electric pad. The same dangers are attached to incubators.

One other important factor is a sufficient water-supply to counterbalance the rapid evaporation due to artificially heated and dried air and the excessive excreta of the first few days. As it has been my rule never

TABLE 1.—ENERGY QUOTIENT IN THE FIRST WEEKS OF AUTHOR'S CASES,* AND IN FEER'S CASE

Case.....	Feer's	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Birth-weight, gm..	3,615	740	690	1,360	1,335	1,435	1,420	1,070	1,440	1,935	1,930	1,750	1,890	1,950	2,010	1,765	1,875	1,960
Energy Quotient by weeks—																		
First	..	...	...	120	..	14.7	100	...	102	80	105	80	127	117	94.5	100	104.5	60.5
Second	89	...	...	...	95	55.5	115	...	98.5	99	130	104	159	119	108	100	113.5	88
Third	..	...	122	137	153	100	120.5	159	100	109	128	102+	170	120	118.5	90	110	105
Fourth	..	140	127.5	...	161	116	112.5	152	91	120	131	115	170	112	117.5	125	120	132
Fifth	..	130	113	...	...	136	114	162	109	120	...	119	206	111	115	114	...	110
Sixth	112	128	140	...	...	145	120	162	...	136.5	...	...	...	...	110	...	...	...
Seventh	...	120	136	212	...	148	135	167	130	148	...	...	...	...	...	...	...	...
Eighth	...	142.5	138	216	...	...	144	170	136	171	...	...	...	...	...	...	...	...
Ninth	97	177	196	217	...	...	...	174	137	152	...	...	...	...	...	...	...	...
Tenth	..	224 (Died)	247 (Died)	193	...	...	...	163	115	151	...	...	...	...	...	...	...	...
Eleventh	..	...	...	...	...	...	...	166	115	169	...	...	...	...	...	...	...	...
Twelfth	..	...	...	...	...	...	...	168	110	...	...	...	...	...	...	...	...	...
Thirteenth	..	...	...	...	...	...	...	140	111	...	...	...	...	...	...	...	...	...
Fourteenth	..	...	...	...	...	...	...	132	109.5	...	...	...	...	...	...	...	...	...
Fifteenth	..	...	...	...	...	...	...	...	124	...	...	...	...	...	...	...	...	...

*All left the hospital in good health except Cases 1 and 2.

TABLE 2.—SHOWING RAPIDITY OF INCREASE IN WEIGHT IN AUTHOR'S CASES*

Case	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Birth-weight, gm.	740	690	1,360	1,335	1,435	1,420	1,080	1,440	1,935	1,930	1,750	1,890	1,950	2,010	1,765	1,875	1,960
Gain by weeks, gm.—																	
First	165*	155*	40	15	185*	135	65*	200	300*	260	130*	130	175	240	50	85	25*
Second	20*	35*	75	100	15	65	15*	...	50	250	45	175	235	150	120*	190	65
Third	..	5*	45	85	75	130	20	105	125	260	100	35	300	320	155	110	150
Fourth	25	35	45	90	65	290	80	105	50	265	175	35	390	375	210	190	90
Fifth	15	5	125	..	100	25	95	150	85	...	175	90	300	375	...	150	180
Sixth	5	5	175	..	135	225	95	125	275	...	125	...	...	360	190	...	...
Seventh	10	20	75	..	..	210	65	65	140	...	...	...	...	...	...	...	...
Eighth	15	10	75	..	..	300	100	240	100	...	...	...	...	...	...	...	...
Ninth	5	15	125	..	..	..	100	..	...	...	...	...	...	...	...	...	...
Tenth	20	10	50	..	..	..	75	140	140	...	...	...	...	...	...	...	...
Eleventh	..	..	125	..	..	..	75	112	...	...	...	...	...	...	...	...	...
Twelfth	..	..	85	..	..	..	175	50	...	...	...	...	...	...	...	...	...
Thirteenth	..	..	..	..	..	..	100	40	...	...	...	...	...	...	...	...	...
Fourteenth	..	..	..	..	..	..	115	30	...	...	...	...	...	...	...	...	...
Fifteenth	..	..	..	..	..	..	120	50	...	...	...	...	...	...	...	...	...

*Loss in weight.

to start milk until after the first bowel movement, I have therefore found a frequent necessity for slight purgation with a minimum dose of castor-oil or milk of magnesia. I have endeavored to administer about one-sixth of the body-weight of water (inclusive of that contained in the milk) in twenty-four hours, and as in the smaller infants the first milk is given diluted one to four times during the first few days, it can be

TABLE 3.—SHOWING RANGE OF CALORIES AND DAILY GAIN

Cases	Range of Calories	Daily Gain gm.	Cases	Range of Calories	Daily Gain gm.
1.	....	....	10.	105 -131	37.
2.	....	....	11.	102 -119	21.5
3.	137 -220	12	12.	127 -170	18.
4.	95 -161	14		170 -206	9.5
5.	116 -148	17	13.	111 -120	40.
6.	115 -144	27	14.	94.5-118.5	43.*
7.	132 -170	24.	15.	114 -125	15.
8.	130 -137	24.	16.	104.5-120	23.
	109.5-115	10	17.	105 -132	25.
9.	90 -171	15.			

*Largest baby.

administered partly with the food; otherwise between feedings or per rectum. Example: An infant weighing about 1,200 gm. should receive 200 c.c. of water; should this infant receive 50 c.c. of milk, this can be diluted with 50 c.c. or more of water or sugar solution and the remainder administered either per rectum or between feedings.

6. Disturbed metabolic balance with a standstill in the weight-curve and indigestion with bad bowel movements frequently resulted when 140 calories per kilo were exceeded.

TABLE 4.—ENERGY QUOTIENT STUDIES IN THE FIRST MONTH (FROM OPPENHEIMER)

Studied by	Feer (Normal Child)	Perutz	Hähner	Frick	L. F. Meyer
Birth-weight	3,615	2,470	1,620	1,800	750
Energy quotient by months—					
First	89	101	82	...	...
Second	112	127	119	122	...
Third	97	114	119	134	147
Fourth	92	107	111	121	155
Fifth	...	95	103	111	198

All intestinal disturbances in premature infants should be treated as if they were atrophic infants (decomposition — Finkelstein), as they do not stand starvation well. I have not attempted to speak of the artificial feeding of these infants as I believe it should be discouraged in all cases in which the infant is born at thirty-six weeks or under. Artificially fed, full-term infants also require a higher food-value than the same infants at the breast, the average added requirement being 10 to 20 calories per kilo, which would also hold true in premature infants, and this adds materially to the dangers of this method of feeding. The energy quotient

needed in my series of cases to maintain the metabolic equilibrium ranged quite close to 90, while in the full-term infant 70 is usually sufficient. The method of administration of food in each case varied with the vitality of the infant. In all cases of prematurity, syphilis should be thought of and in cases in which there is the slightest suspicion, the infant must not be placed directly on the breast.

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THE USE OF MALT SUGAR AND HIGH PERCENTAGES OF CASEIN IN INFANT FEEDING *

JOHN LOVETT MORSE, A.M., M.D.
BOSTON

The differences in the digestibility and availability of human and cow's milk by infants, according to Finkelstein and Meyer,[1] are not due to qualitative differences in the constituents of the milk. Casein causes no disturbances of digestion. Fat and sugar have no pathologic action unless the intestinal functions have been injured. The fat and sugar of human milk can act in the same way if the injury to the intestine is severe enough. The action of the whey from human and from cow's milk is, however, different. A baby can digest the various food elements when they are in human whey but cannot when they are in the whey of cow's milk. Any other medium than human milk interferes with the functionating of the intestinal epithelium. They have, however, in spite of many experiments, been unable to find a better menstruum than the whey of cow's milk.

They believe that the diarrheal diseases of infancy originate in a functional weakness of the intestine, and that this functional weakness is kept up and increased by fermentation. This being so, the first step in treatment is to stop the fermentation and in this way give the intestine an opportunity to repair itself. This has been done in the past by cutting down the amount of food and by giving foods insusceptible to fermentation. This method is sufficient in many cases; in others, however, fermentation continues even when the caloric needs are not covered. In such cases the only recourse in the past has been human milk.

Fat, sugar and protein are all susceptible to decomposition. The medium in which they are contained, that is, the whey, may also play a part in the decomposition. Czerny and others have attributed the chief rôle in fermentation to fat, but Finkelstein and Meyer conclude from their experiments, in which they obtained the same results in these cases with diluted whole milk as they did with diluted skimmed milk and buttermilk, that the fermentation is not due to fat. They also found that the addition of freshly prepared casein to skimmed milk and to dilutions of whole milk, which babies with indigestion were taking, not only did not make the babies worse but apparently improved them. The

*Read at the meeting of the American Pediatric Society, Lake Mohonk, N. Y., June, 1911.

1. Finkelstein and Meyer: Jahrb. f. Kinderh., 1910, lxxi, 525 and 683; Berl. klin. Wchnschr., 1910, lvii, 1165; München. med. Wchnschr., 1911, lviii, 340.

thin, acid, green stools changed in a few days to typical light-colored and dry soap-stools. They conclude, therefore, that casein has an antifermentative action and is harmless. Milk-sugar must, therefore, by exclusion, be the cause of the fermentation. They found that the addition of milk-sugar to the food of babies whose diarrhea was controlled by the addition of casein, resulted in the recurrence of the abnormal stools. The long-continued diminution of the carbohydrates in the food also relieved the symptoms, even if the casein was not increased. They adduce as further evidence that the primary cause of fermentation lies in the sugars and not in the fats, the fact that when babies having fatty diarrhea were given the same amounts of casein and fat in various saline, sugar-free solutions instead of in the sugar-holding whey, the fatty diarrhea ceased. Milk diluted with water was, moreover, better borne than milk diluted with whey.

They sum up as follows: Sugar is the special and primary cause of fermentation. Neither normal nor abnormal acidification can take place without it. The fat is never involved primarily. It is injurious in that it causes an acid fermentation. The fermentation of the sugar is dependent on two main factors—first, the concentration of the whey, more or less work being thrown on the intestinal epithelium according to whether the concentration is more or less suitable for the intestine; second, the relative proportions of casein and sugar in the mixture. Here, therefore, as always in matters of nutrition, when considering the chemistry of the intestine, it must be remembered that it is impossible to judge of the action of one element alone, and that the final result depends on the relative proportions of the various organic and inorganic elements of the food.

They conclude, therefore, that the principles on which the preparation of a food to combat intestinal fermentation depend are: a diminution in the quantity of milk sugar, a diminution of the salts through dilution of the whey and an increase in the casein, with varying, and, under certain circumstances, not inconsiderable amounts of fat. After improvement has begun an easily assimilable and consequently little fermentable carbohydrate should be added. They consequently developed a food to meet these indications, to which they gave the name of "Eiweissmilch." This food is prepared as follows:

Heat one quart of whole milk to 100 F. Add four teaspoonfuls of essence of pepsin and stir. Let the mixture stand at 100 F. until the curd has formed. Put the mass in a linen cloth and strain off the whey from the curd. Remove the curd from the linen cloth and press it through a rather fine sieve two or three times by means of a wooden mallet or spoon. Add one pint of water to the curd during this process. The mixture should now look like milk and the precipitate must be *very finely* divided. Add 1 pint of buttermilk to this mixture.

Finkelstein and Meyer use buttermilk in the preparation of this food for the following reasons: (1) because of the small amount of milk

sugar which it contains; (2) to obtain the good effects of the lactic acid, and (3) because buttermilk can be kept for a long time.

The composition of this food is:

Fats	2.5 per cent.
Sugar	1.5 per cent.
Proteid	3.0 per cent.
Salts	0.5 per cent.

One quart of this milk contains about 370 calories.

They used this food in a great variety of conditions accompanied by diarrhea, such as dyspepsia, decomposition, intoxication and parenteral infections, and in their original paper claimed good results in all, but not in the new-born.

The general principles laid down by them for the use of this food in these conditions are as follows: A preliminary catharsis, if necessary, followed or not by an initial period of starvation and tea diet, as the case may be; small amounts of casein milk; larger amounts of casein milk; the addition of some carbohydrate other than milk-sugar or cane-sugar, preferably some dextrinized preparation of malt-sugar. They claim that the loose, green stools are quickly replaced by typical soap-stools and that the addition of malt-sugar does not cause a recurrence of the symptoms of fermentation. They call attention to the fact that on account of the low nutritive value of the food there is certain to be a loss of weight in the beginning of the treatment. This is followed by a stationary period, then, when the amount of food is increased and carbohydrates added, by an increase in weight. They found that babies could be kept on this food for months and continue to thrive.

Birk[2] obtained good results in the great majority of thirty cases of various sorts in which the patients were treated with casein milk. He believes that it is unquestionably of great service in many cases; that it is indicated not only in the acute toxicoses, but also in chronic disturbances of nutrition, in so far as there is in these cases an intolerance against fat; that is, in the cases in which buttermilk is ordinarily given. He found that as the result of the diminution of the sugar and the consequent diminution of the fermentation in the intestine the tolerance of the intestine toward fat increased.

Reuss and Sperk[3] also obtained favorable results in a small number of cases. They, however, attribute a part of the favorable results to the action of bacteria, believing that the administration of large amounts of casein diminishes fermentation and acts as the provocator of large amounts of alkaline intestinal secretion which neutralizes acid products and favors the development of bacteria antagonistic to fermentation.

2. Birk: Monatschr. f. Kinderh., 1910, ix, 140.
3. Reuss and Sperk: Wien. klin. Wchnschr., 1910, xxiii, 9.

Welde[4] used it in sixty cases of various types and obtained satisfactory results. Nothmann[5] also obtained good results in a few cases, but Rommel[6] and Ibrahim[7] did not have as favorable results.

Braumüller[8] also used the casein milk in fourteen cases. He found, however, that in three of his cases serious symptoms developed when sugar was added to the mixture. In these cases the addition of even small amounts of sugar was enough to bring on a slow but uncontrollable decline, of which there had previously been no warning signs. A possible explanation is that the infant's powers of assimilation are greatly weakened and that it can produce only a limited amount of ferments. The large amounts of casein and fat in the casein milk demand so much of this power that the organism has but little strength left to produce the ferments which are needed to take care of the sugar. Pawlow has shown, moreover, that the sudden withdrawal of sugar produces an extinction of the secretion of the ferments concerned. Braumüller consequently advises delay in the addition of sugar in the severer cases and the substitution of oat starch for sugar in the beginning.

Finkelstein and Meyer[1] state in a later paper that this method of treatment is worthy of employment in the disturbances of nutrition in infants which are accompanied by diarrhea, no matter of what sort or severity. In their latest paper on "The Technique and Indications for Feeding with Eiweissmilch" they are evidently endeavoring to meet criticisms which have been made of their method of feeding. In this paper they still claim perfect results, and say that the bad results obtained by others are due to imperfect technic or to a bad choice of cases. They now, however, warn especially against the continuance of under-feeding, advising the administration of as much as from 180 to 200 calories per kilo. They also warn against too long delay in the addition of carbohydrates, especially in feeble children, and against giving up treatment, withdrawing the carbohydrates and diminishing the quantity of food, if symptoms recur. They claim, too, that casein milk must not be combined with any other mixture, not even with human milk.

Leopold[9] has recently summed up the teaching of Finkelstein and his school as to the disturbances of nutrition caused by sugar in the food. These are of three sorts. It is, according to them, the chief cause of fermentation and consequently of diarrhea, plays an important part in the retention of water and, consequently, in the weight, and may cause an increase in the temperature, the so-called "sugar-fever."

4. Welde: Therap. Monatsh., 1911, xxv, 83.
5. Nothmann: Jahrb. f. Kinderh., 1910, lxxii, 347.
6. Rommel: Jahrb. f. Kinderh., 1910, lxxii, 347.
7. Ibrahim: Jahrb. f. Kinderh., 1910, lxxii, 347.
8. Braumüller: München. med. Wchnschr., 1910, lvii, 2571.
9. Leopold: Ztschr. f. Kinderh., 1910, i, 217.

He also investigated the action of the different forms of sugar, given by the mouth, in relation to the causation of diarrhea, to weight and to temperature. He studied chemically-pure lactose, saccharose, maltose and glucose, Soxhlet's Nährzucker and Löflund's Nährmaltose. The analyses of Soxhlet's Nährzucker and Löflund's Nährmaltose are as follows:

		Per cent.
Soxhlet's Nährzucker =	maltose	52.44
	dextrin	41.26
	sodium chlorid	2.00
Löflund's Nährmaltose =	maltose	40.00
	dextrin	60.00
	salts	.30

Milk sugar caused diarrhea the most easily, probably on account of its relatively slow absorbability, while the dextrin-maltose mixtures were comparatively well borne. The retention of water with the various sugars depended chiefly on whether the sugar caused diarrhea or not. In some cases, however, there was a retention of water in spite of the diarrhea. Fever occurred much less frequently with the dextrin-maltose mixtures than with the pure sugars. The tendency to increase in temperature stood in close relation to the action of the given sugar in causing diarrhea. Fever never occurred in patients whose stools remained normal, proving that there must be a lesion of the intestine before fever occurs. When sugar was added to different foods, fever occurred less often with foods poor in whey than with those rich in whey.

He concludes that when a single dose of from 10 to 30 gm. of the different forms of sugar ordinarily used in feeding babies is given, the dextrin-maltose mixtures produce diarrhea and fever less easily than the pure sugars. Milk-sugar seems to be the one of the pure sugars which causes diarrhea and fever most easily. The condition of the intestine and the character of its contents, as well as the salts and sugar, are of significance in the etiology of "sugar fever." The temperature reaction occurs more frequently when the food is rich in whey than when it is poor in whey.

Having seen the rise and fall of many much-heralded foods and routine methods of feeding in the past, and being a firm believer in the adaptation of the food to the individual infant, I was not prepared to accept Finkelstein and Meyer's statements that this method of treatment is worthy of employment in all the disturbances of nutrition in infants which are accompanied by diarrhea, no matter of what sort or severity, and that all the bad results obtained by others are due to imperfect technic or to the bad choice of cases. Neither was I prepared to believe that all these disturbances occur independently of bacterial action, as the authors seem to imply. It did seem to me, however, that they had made out a very strong case against sugar as the etiologic factor in fermenta-

tion, and that the treatment of fermentative conditions with a food low in sugar and high in proteins was, therefore, a rational one. The substitution of the dextrin-maltose mixtures for lactose also seemed rational. It did not seem rational, on the other hand, to treat all cases in the same way, or to give all babies the same food without regard to their individual digestive capacities. The reasons given for the addition of buttermilk to the food, viz., its low salt content, its resistance to decomposition and its lactic acid content, did not seem very satisfactory, moreover, because the amount of salts in the precipitated casein is low, as it is in buttermilk, there is no reason for keeping the food a long time, and no evident reason why lactic acid should be of use in intestinal fermentation.

It seemed to me, however, that it would be possible to take advantage of the main principles of this method of treatment of the intestinal fermentative conditions and at the same time avoid the disadvantages of a routine food and the apparently superfluous buttermilk by applying them in the modification of milk by the percentage method. I was enabled to do this through the courtesy of the Walker-Gordon Laboratory. It was possible, by the use of cream containing a high percentage of fat, to reduce the amount of unprecipitated casein and whey proteins to a very small percentage. Any percentage of proteins desired could then be added in the form of precipitated casein. The precipitated casein was prepared according to Finkelstein and Meyer's method, the casein from one quart of milk being made into an emulsion with sufficient water to make one pint. This emulsion, according to the analysis made at the Walker-Gordon Laboratory, contained less than 0.50 per cent. of sugar. It was thus possible to get mixtures containing 3 per cent., or even more, of fat, with less than 1 per cent. of milk-sugar. The "maltose" used in the mixtures contained 88 per cent. of carbohydrates, 57.1 per cent. being in the form of maltose and 30.9 per cent. in the form of dextrin. It contained no starch and had no diastatic action. Since the percentages of the different ingredients in the mixtures were known, it was always possible to calculate the number of calories taken.

This method of treatment was tried only in cases of intestinal disturbance associated with evidences of fermentation, and in which there was none or, at most, very little vomiting. Owing to the time of year at which this study was undertaken, only sixteen suitable cases were available. Eight of these cases must be excluded because of the short duration of the trial, the use of breast-milk in addition, or the presence of associated diseases, leaving only eight for analysis. The general impression derived from the few cases of parenteral infections was that this method of treatment was not very useful in these conditions. Eight cases is, of course, too small a number to justify any sweeping conclusions. They were carefully studied, however, and seem to show, or at any rate to illustrate, certain points fairly definitely. A detailed account of some

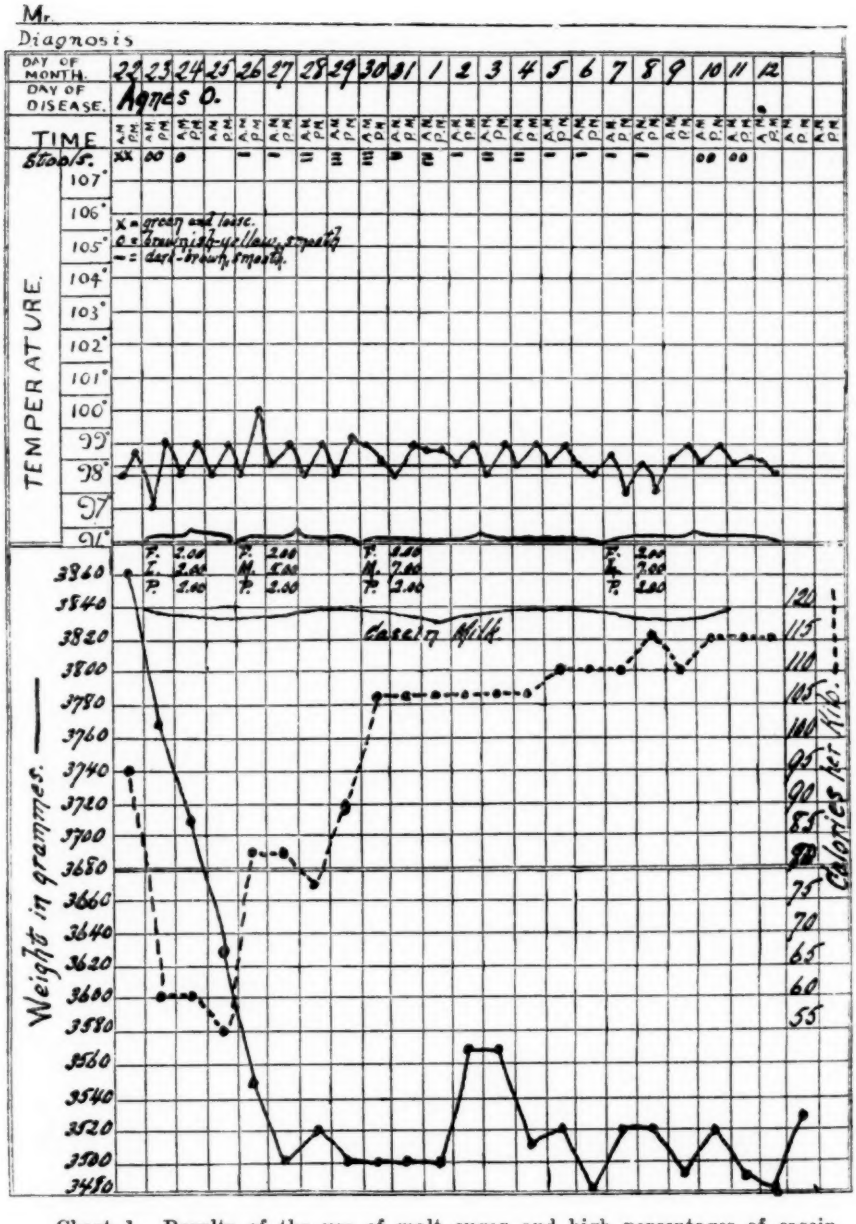

Chart 1.—Results of the use of malt sugar and high percentages of casein in Case 1.

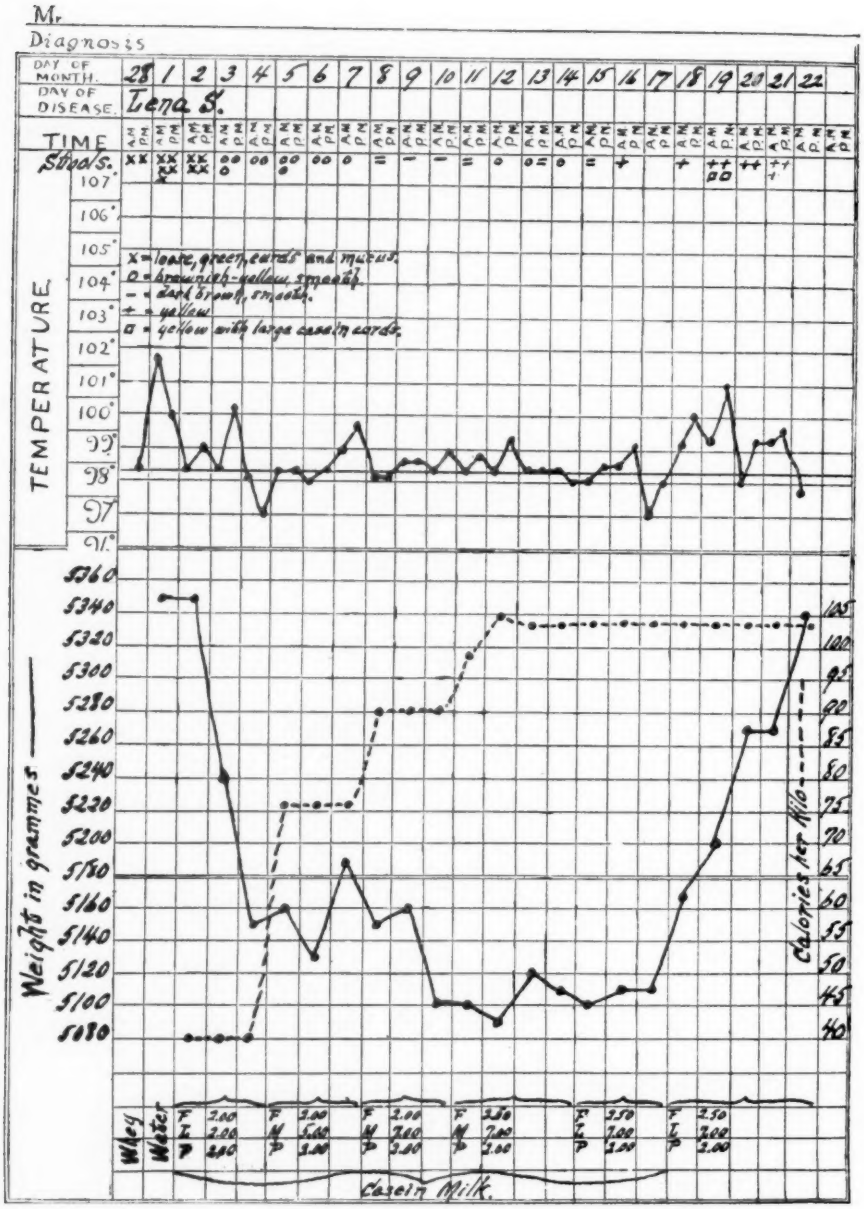

Chart 2.—Results of feeding malt sugar and high percentages of casein in Case 2.

of these cases or of parts of them will, therefore, be more instructive than any collective analysis.

CASE REPORTS

CASE 1.—A. O., 7 weeks old, was nursed for two weeks, after which she was fed on some milk mixture of unknown composition. She was brought to the Infants' Hospital by a woman who knew nothing as to the condition of her digestion or the character and number of her stools. She was in good general condition and the physical examination showed nothing abnormal. She was given a mixture containing 2 per cent. of fat, 7 per cent. of lactose, 0.75 per cent. of whey proteins and 0.25 per cent. of casein. She took this well and did not vomit, but had two large, loose, light-green stools daily.

March 23, two days after entrance, she was put on eight feedings of 75 c.c. each of a mixture containing 2 per cent. of fat, 2 per cent. of lactose and 2 per cent. of proteins, at least 1.80 per cent. of which was in the form of precipitated casein. The stool the next day was brownish-yellow, smooth and soft. This mixture gave only 60 c. per kilo, and the weight dropped from 60 to 80 gm. daily.

The food was increased March 26 to 80 c.c. at a feeding, and maltose enough added to raise the sugars to 5 per cent. She then got a little more than 80 C. per kilo and the loss of weight ceased. The stools at once became dark brown and pasty, but contained a large amount of fat in the form of soap.

Two per cent. more of maltose was added March 29, bringing the percentage of sugar to 7, giving 100 or more C. per kilo. On this she continued to have from one to three brown and pasty stools daily, and just about held her weight.

The maltose was changed to lactose April 7, the percentage of sugar being kept at 7. The color of the stools changed to yellowish-brown but no signs of fermentation developed The precipitated casein was replaced by ordinary milk proteins April 11 without any change in the general condition or stools (Chart 1).

In this instance the green color of the stools ceased at once when the percentage of lactose was reduced to 2 and that of the casein increased to 2. It did not recur when the percentage of sugar was increased to 7 by the addition of maltose. The tendency to fermentation was apparently relieved by this treatment, as the green color did not return when the maltose was replaced by lactose. It illustrates the loss of weight which takes place at first when the percentage of sugar is cut down. It is noticeable, however, that the baby did not gain when it was taking 100 or more calories per kilo.

CASE 2.—L. S., 4 months old, had been fed on a mixture containing 2.50 per cent. of fat, 6 per cent. of sugar and 1 per cent. of proteins and had done well until February 24, when she began to have four or five loose, green stools daily. She was admitted to the Infants' Hospital February 28. Physical examination showed nothing abnormal except the signs of slight malnutrition. She was given whey the first twenty-four hours and continued to have stools of the same character. March 1 she was given 2 teaspoonfuls of castor-oil and put on water for twenty-four hours.

March 2 she was put on a mixture containing 2 per cent. of fat, 2 per cent. of lactose and 2 per cent. of proteins, at least 1.80 per cent. of which was in the form of precipitated casein. The stools rapidly changed in character, that passed during the afternoon of March 3 being light yellowish-brown and smooth, with a little mucus but no curds. It contained no neutral fat or fatty acids, but a moderate amount of soap. She lost a little weight.

March 5 enough maltose was added to raise the percentage of sugar to 5. The stools then became somewhat more brown and were macroscopically perfectly digested. Two per cent. more of maltose was added March 8, and March 11 the percentage of fat was increased to 2.50. While taking this mixture she had from one to three smooth, dark-brown stools daily. They contained only a small amount of soap.

Lactose was substituted for maltose March 15, the percentage of sugar being kept at 7. The green stools did not recur after the change. The precipitated casein was replaced by ordinary milk proteins March 18. The stools then began to show an occasional casein curd but contained no fat, either macroscopically or microscopically. Gain in weight began at this time, whereas the weight had been stationary on the maltose and casein milk mixture of the same caloric value (Chart 2).

In this instance also the green color of the stools ceased at once when the lactose was reduced to 2 per cent., and did not return when the percentage of sugar was increased to 7 by the addition of maltose. The tendency to fermentation was apparently relieved by the treatment, as the green color did not return when the maltose was replaced by lactose. The power of assimilating fat increased while on the maltose and casein milk mixture. It is noteworthy that casein curds appeared in the stools when ordinary milk proteins were substituted for the precipitated casein, suggesting that the casein is more easily digested after it has been precipitated and finely divided by rubbing through a sieve than when it has not been treated in this way.

CASE 3.—W. C., aged 5 months, was born one month before he was expected, but weighed 7½ pounds. He was never nursed, but was fed on a great variety of proprietary foods. He did well, nevertheless, for the first three months. Since then he had been constipated, but the stools had been green and undigested. He had lost weight steadily. He was small and poorly nourished, weighing on admission to the Infants' Hospital only 3,250 gm. The physical examination showed nothing abnormal except the signs of malnutrition. A skin tuberculin test was negative. The urine was normal.

He was given a teaspoonful of castor-oil at entrance and put on barley-water, containing 0.75 per cent. of starch, for twenty-four hours. He was then given a mixture containing 2 per cent. of fat, 2 per cent. of lactose and 2 per cent. of proteins, at least 1.80 per cent. of which was in the form of precipitated casein. He lost weight rapidly on this mixture and the stools continued to contain a few fine, soft curds. Microscopically, however, the stools contained but little fat, this being in the form of soap.

Four days later the percentage of sugar was increased to five by the addition of maltose. He continued on this mixture until his death, two weeks later. He lost weight more rapidly when the caloric value of his food was over 115 C. per kilo than when it was at about this level. The stools contained no fat, except that there were occasionally a few fine, soft curds (Chart 3).

In this instance there was but little evidence of fermentation. The stools were perfectly normal after beginning the mixture of maltose and precipitated casein and the fat was well utilized. He nevertheless failed steadily and died. He was willing to take all the food given him, but an increase in the caloric value of the food hastened rather than retarded the loss of weight (paradoxical reaction). In most instances, however,

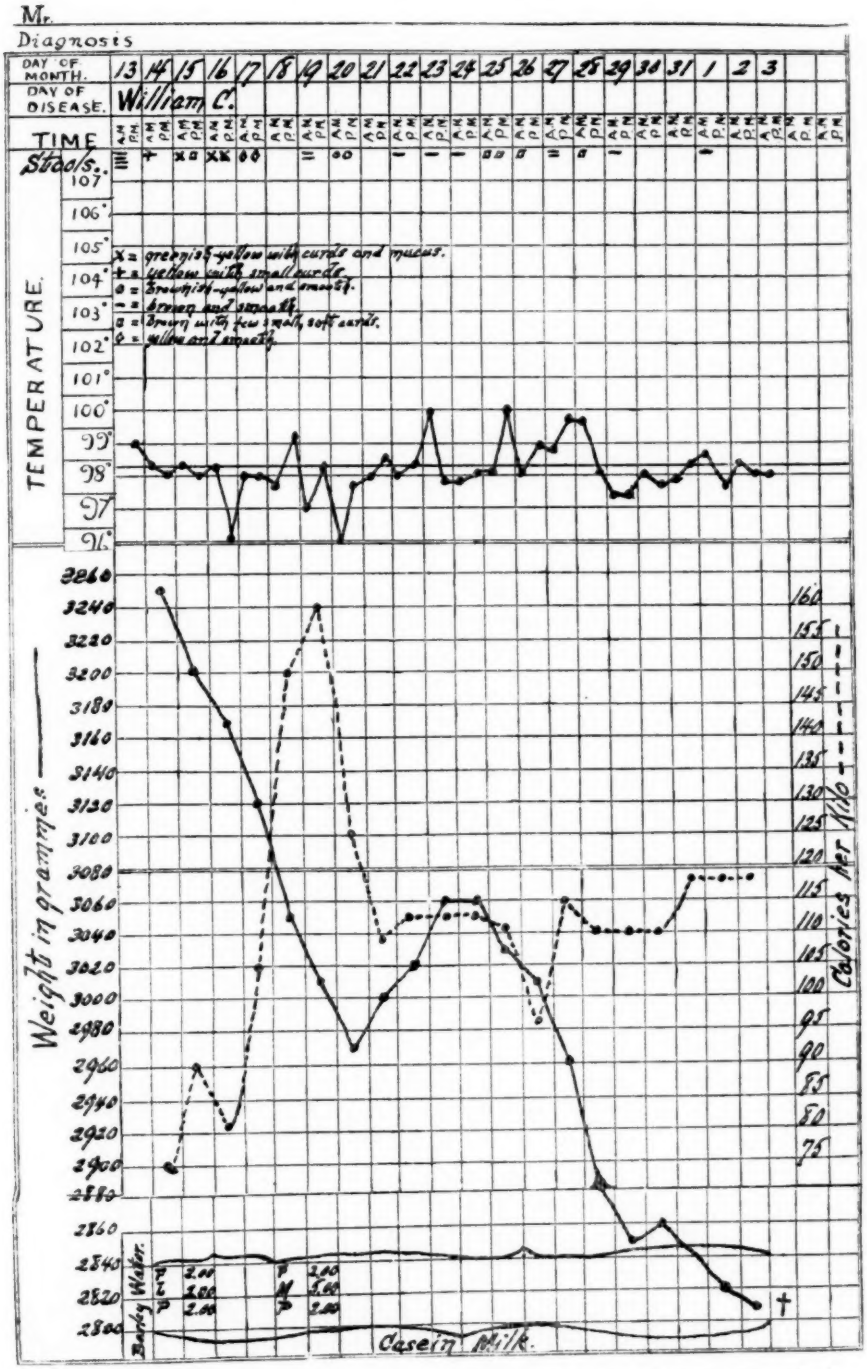

Chart 3.—Results of feeding malt sugar and high percentages of casein in Case 3.

it was impossible to get the babies to take more than 120 calories per kilo; if they did the digestion was at once disturbed. Judging from my experience with these cases it would seem very difficult to give babies from 180 to 200 C. per kilo of "casein milk," as recommended by Finkelstein and Meyer.

CASE 4.—H. C., aged 4 months, had been fed for the last two months on a mixture containing 2.50 per cent. of fat, 6 per cent. of lactose and 1.50 per cent. of proteins. She had been having daily for some weeks five or six green or greenish-yellow stools, containing some curds. Physical examination showed nothing abnormal except the signs of slight malnutrition.

She was given on admission to the Infants' Hospital, April 6, a mixture containing 1 per cent. of fat, 7 per cent. of lactose, 0.90 per cent. of whey proteins and 0.25 per cent. of casein. While taking this mixture her stools were nearly normal. Thirty-six hours later it was changed, because of its low caloric value, to a mixture containing 2 per cent. of fat, 7 per cent. of lactose, 0.90 per cent. of whey proteins and 0.50 per cent. of casein. She immediately began to have numerous green or greenish-yellow, undigested stools.

Two days later she was given a mixture containing 2 per cent. of fat, 2 per cent. of lactose and 2 per cent. of proteins, at least 1.80 per cent. of which was in the form of precipitated casein. The green color of the stools ceased at once, but the small curds and mucus persisted.

Three days later the percentage of sugar was increased to 5 by the addition of maltose. The stools became normal after a few days, although, in spite of a sufficient intake of calories, there was a progressive loss of weight.

The mixture was then changed to one containing 3 per cent. of fat, 6 per cent. of lactose and 1.50 per cent. of ordinary milk proteins. The movements continued good and the baby began to gain in weight at once, although the caloric value of the food was no higher (Chart 4).

The good effect of this method of treatment on the fermentation was evident in this instance also, but the failure to gain in weight, although the number of calories was sufficient, was also evident.

In two instances it was impossible to increase the percentage of maltose above 5 without causing vomiting. The symptoms of fermentation were relieved in these cases as in the others, but the same difficulty was experienced in making the babies gain weight. This difficulty was encountered in almost every instance, although the number of calories given was theoretically sufficient. A number of them began to gain at once, moreover, after they were changed over to ordinary mixtures, although the number of calories taken was not increased. No difficulty was encountered in changing from the maltose and precipitated casein mixtures after the symptoms of fermentation were relieved, although the stools were sometimes temporarily not as well digested.

I feel certain from my study of these few cases that this method of treatment of intestinal disturbances associated with fermentation in infancy, by the withdrawal of lactose and by raising the percentage of casein, followed by the addition of dextrin-maltose, is a most valuable one. I am inclined to think that the finely divided precipitated casein, freed from the whey proteins, has some advantages over the natural

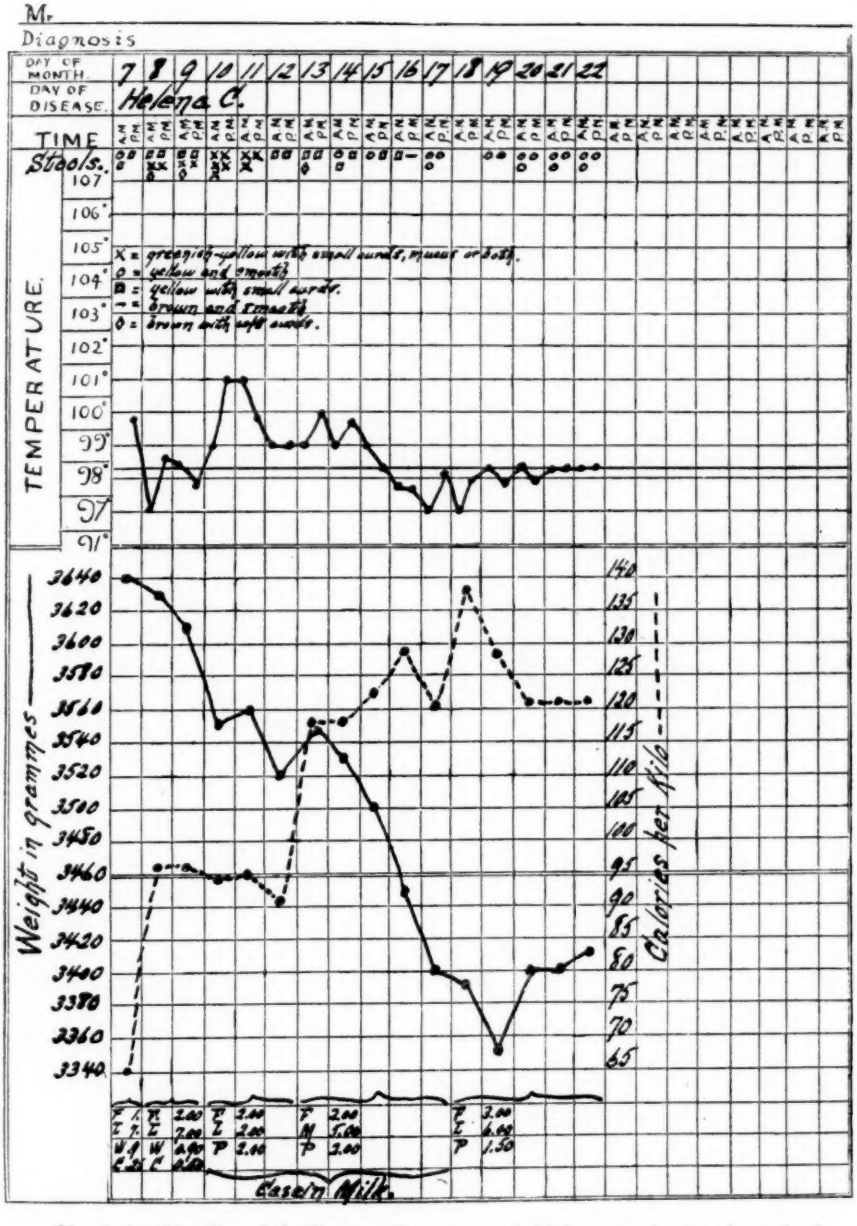

Chart 4.—Results of feeding malt sugar and high percentages of casein in Case 4.

milk proteins, but I am not sure of this point. I am also inclined to think that after the symptoms of fermentation are relieved babies do not thrive as well on these mixtures as on ordinary mixtures, and consequently believe that they should be discontinued as soon as these symptoms are relieved. I also believe, on account of the failure of babies to gain on these malt sugar and precipitated casein mixtures, even when given in amounts amply sufficient to cover the caloric needs, that this method of feeding is not one generally applicable.

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A NOTE ON THE BACTERIOLOGIC EXAMINATION OF LYMPHATIC GLANDS IN SCARLET FEVER *

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Considerable interest was recently aroused by the report of Vipond[1] regarding the specific organism of scarlet fever. The author claims to have secured a rapidly-growing spore-forming bacillus from the lymphatic glands of seven consecutive patients with scarlet fever. The injection of broth cultures of this organism is reported as having produced scarlet-fever in five monkeys and two rabbits; that the same bacilli were secured from the lymph-glands of these animals, and further, that another monkey and a rabbit contracted the disease by contact with these animals. In other words, the postulates of Koch were fulfilled to the letter.

His report was startling to those of us who have been culturing the glands of scarlet-fever patients for some time. To determine the cause of scarlet-fever has been the aim of many workers and not a few of these included the glands in their investigations. Klein claimed many years ago that a streptococcus was the causal organism, and Gordon also leaned toward this belief. Class believes that the diplococcus described by him is the cause and later Mallory thought that his protozoon-like bodies found in the skin of scarlet-fever patients may be the cause. None of these claims, however, has been substantiated. The discovery of the exact cause of scarlet fever is certainly very much desired because then the paradoxes of this disease may be understood and its control and treatment made more effectual.

In a study of the glands of twenty-six patients with scarlet-fever, including a case cultured at autopsy, I did not find any organism, in any case, in any way resembling the bacillus described by Vipond.

After thorough sterilization of the skin overlying the enlarged glands a few drops of bloody serum were removed by means of an all-glass sterilized syringe. Cultures were made on coagulated blood-serum, plain and gelatin agar-agar and in bouillon. These were incubated at 37 C. and examined daily for four days.

The following twelve cases were cultured by the above method when the glands were enlarged sufficiently to be reasonably certain that one

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*From the Laboratory of the Philadelphia Hospital for Contagious Diseases.

1. Vipond, A. E.: Scarlet Fever, Preliminary Note of its Specific Microorganism, Arch. Pediat., 1911, xxviii, No. 7, 564.

could strike and culture the gland by puncture. In only one of these, Case 3, was suppuration present. In this case softening had just begun and a streptococcus was secured in pure culture.

CASE 1.—Mary L., aged 3 years, admitted July 25, 1911, with scarlet fever of moderate severity, accompanied by general glandular enlargement. Two days later the cervical glands on left side were markedly enlarged and quite hard. Cultures gave growth of a diplococcus. No bacilli nor streptococci.

CASE 2.—James C., aged 4 years, admitted July 22, 1911, with simple scarlet fever. Cultures of glands six days later were sterile.

CASE 3.—Hyman H., aged 5 years, admitted July 24, 1911, with a rather severe attack of scarlet fever. There was well-marked enlargement of the servical glands, especially in the right side, with slight softening. Cultures of these glands yielded a growth of a streptococcus of the bacillary type.

CASE 4.—Frank G., aged 5 years, admitted Aug. 3, 1911, on the fourth day of a mild attack of scarlet fever. Eight days later the cervical glands on the left side were enlarged to about the size of a pigeon's egg. Cultures sterile.

CASE 5.—Martin W., aged 3½ years, admitted Sept. 5, 1911, with mild scarlet fever. Six days later a cervical gland on the right side was enlarged to the size of a marble. Cultures were sterile.

CASE 6.—Hendel M., aged 3 years, admitted Sept. 3, 1911, with simple scarlet fever. Eight days later a gland on the left side of neck was enlarged to the size of a marble. Cultures were sterile.

CASE 7.—Alice B., aged 4 years, admitted Sept. 1, 1911, with simple scarlet fever. Eleven days later the cervical glands were enlarged to a moderate degree. Cultures sterile.

CASE 8.—Adolph S., aged 3 years, admitted Aug. 25, 1911, with scarlet fever of moderate severity accompanied by general glandular enlargement. Eighteen days later the cervical glands on the left side were enlarged to size of small marble. Cultures sterile.

CASE 9.—Fannie S., aged 10 years, admitted Sept. 12, 1911, with scarlet fever of moderate severity, accompanied by general glandular enlargement. Cultures were made of cervical glands on same day which gave a pure culture of a streptococcus.

CASE 10.—Molly K., aged 5 years, admitted Aug. 29, 1911, with simple scarlet fever. Eight days later the cervical glands on the left side were enlarged to the size of a pigeon's egg. Cultures sterile.

CASE 11.—W. D., aged 3 years, admitted Sept. 13, 1911, with severe anginose scarlet fever accompanied by general glandular enlargement. The cervical glands on the left side were very much enlarged and quite hard. Blood-cultures gave pure growth of a streptococcus. Cultures of glands made two hours after admission yielded a growth of a streptococcus. Patient died in twelve hours. Glands were removed and cultures of these gave a growth of a streptococcus.

In none of these cases, cultured from the second to the eighteenth day of disease, were bacilli found. In three cases, or 27 per cent., streptococci were secured.

In the second group of fifteen cases cultures were made after the glands had been incised. It seems reasonable to suppose that these bacilli would be found even after the glands had softened and were discharging. The following organisms were secured, isolated and identified by ordinary morphologic and cultural characteristics:

Streptococcus alone in 3 cases.
Staphylococcus aureus alone in 6 cases.
B. pseudo-diphtheriticus alone in 2 cases.
B. pyocyaneus alone in 1 case.
Streptococcus and ***Staphylococcus aureus*** together in 2 cases.
Streptococcus and ***B. pyocyaneus*** together in 1 case.

Of the two cases yielding a pure culture of what we called "pseudo-diphtheria" bacilli, one had discharging glands for five weeks and the second for two and a half weeks. These bacilli were of medium length; solid; Gram-positive; non-motile; non-spore-forming; grew luxuriantly on agar-agar, yielding a heavy, white, moist growth; did not produce acid in Hiss serum-water mixture containing 1 per cent., respectively, of the following sugars: dextrin, saccharose, lactose, dextrose, galactose, glucose, levulose, mannite and inulin. Cultures were grown in 1 per cent. glucose + 0.5 bouillon for forty-eight and ninety-six hours and injected subcutaneously into 250-gram guinea-pigs. The pigs did not show any evidences of toxemia. These organisms resemble those found in about 70 per cent. of cases of suppurative otitis media complicating scarlet fever. These organisms do not resemble those described by Vipond.

THE INTESTINAL INFANTILISM OF HERTER*

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At the last meeting of the Association of American Physicians a year ago Dr. Christian A. Herter presented a paper on intestinal infantilism, a definite condition which he recognized, analyzed, and, after exhaustive study, published with a very complete description of its characteristics.

Notwithstanding the great amount of scientific work accomplished by Dr. Herter, it seems likely that his name will be perpetuated in connection with this condition of intestinal infantilism more than with any other work that he did, for he described a condition that was never before carefully studied, and thus established it as a distinct disease with characteristic symptoms, intestinal flora and changes in the urine.

The study of different types of dwarfs (see table) has only recently attracted much attention, and while different classifications have been made it is probable that the types described by different men under different names could really be brought together in a general and simpler classification had we fuller information concerning them.

TYPES OF DWARFS

SEXUAL: Small adults.
ASEXUAL (Infantilism):
Infant type—Anangioplasia (Loraine).
Adolescent type (Brissaud).
Lymphatic.
Mongolian.
Thyroid—Cretinism.
Achondroplasia.
Intestinal (Herter).
Hepatic (Cautley).
Pancreatic (Bramwell).

All classifications agree that dwarfism should be divided into sexual, in which the sexual development is normal, and the asexual or infantile type, and under this latter head most of the cases are classified. Thus in France, Loraine has described a type of infantilism wherein the extremities are small, the head is large, and the individual has thus the

*Read at the annual meeting of the Association of American Physicians, Atlantic City, May, 1911.

infantile relationship in size between head, trunk and limbs, and this condition he believed to be due to congenital lack of development of the arteries. Brissaud, on the other hand, has described another type in which the head is small, the face long, the limbs long, indeed an adult type of body. A lymphatic type has also been described in France, in which the child grows very stout, and in which sudden death may occur from a violent shock.

The Mongolian type is familiar and evidently belongs in a category of its own. The cretin again is a distinct type of which we have full information.

Cautley mentions an hepatic infantilism occurring with cirrhosis of the liver, while Bramwell has reported one case of infantilism apparently due to lack of function of the pancreatic gland and cured by administration of the pancreatic extract, and this case of Bramwell's has clinically much in common with the cases classified by Herter; but as there is no record of any careful study of the urine and the bacteriology of the feces, it is impossible to say whether it would come under Herter's group. This individual, however, had large, fatty stools, the distended abdomen and the good appetite which usually are associated with the infantilism of Herter.

Herter published in 1908 a monograph on five children whom he had carefully studied, all of whom had certain intestinal symptoms, showing a change in the intestinal flora and a lack of growth. He stated that he had seen ten such cases.

HERTER'S CASES

CASE 1.—The first of his cases was a boy 8 years old, who did well until he was 3 years of age, when he weighed 31 pounds. Disturbed digestion with diarrhea then occurred, so that for the succeeding four years no gain in weight occurred, the weight varying between 25 and 28 pounds. There was moderate anemia, lassitude, good appetite, and large, soft, gray, gaseous stools.

CASE 2.—A girl of 9 years developed normally until the end of the second year, when certain gastric symptoms appeared, followed by impaired nutrition, retarded development and distended abdomen. There was moderate anemia with large, grayish, gaseous stools. This child weighed at 9 years 47 pounds.

CASE 3.—The third case, a girl of 4 years, when first under observation, was emaciated, abdomen distended and there was moderate anemia. The movements were large, acholic, two or three daily. Diarrhea was frequent when carbohydrates were advised.

CASE 4.—Boy of 3 years, did well for the first year, after which there was irregular intestinal trouble with diarrhea, anemia, distended abdomen, and large gray movements. Weight at 20 months was 16 pounds, length 31 inches.

CASE 5.—Girl 9½ years old, never did well; had measles at 18 months, after which she had digestive troubles with tendency to diarrhea, with soft, light-colored stools, abdomen distended, and carbohydrate incapacity. At 5½ years her weight was 21¾ pounds, height 35 inches. She was pale, her tongue was coated, and there was great listlessness. At 9½ years her weight was 33 pounds, height 38¼ inches, head circumference 20 inches.

The symptoms that Dr. Herter finds developed in these children are:

1. An arrested development of the body. The child stops growing as it stops gaining in weight. On the other hand, the mental development of the child is fair.

2. The marked abdominal distention is common in all of them, often with dilation of the abdominal veins over the upper part of the abdomen. There is usually a moderate anemia, and what is very characteristic, marked fatigue. The intestinal symptoms are a tendency to looseness of the bowels, with occasional attacks of diarrhea, often with fatty stools, although there may be but little fat in the food. They are apt to have an excessive appetite and thirst, an increased secretion of urine, and usually have cold hands and feet. Symptoms of rickets may be present.

3. The most interesting part of this study of Herter's is the result of the examination of the feces. Herter has found in these cases an absence of the ordinary bacterial flora of the intestines of young children; that the dominant organisms present are Gram-positive organisms; that the prevailing organism is the *Bacillus bifidus* of Tissier, an organism of the sort observed by Escherich in an epidemic of diarrhea in a hospital. With this Herter finds two others, the *Bacillus acidophilus* and the *Bacillus infantilis,* which latter may possibly be a variation from the *Bacillus bifidus.* The *Bacillus coli* and the *Bacillus lactis ærogenes* are infrequently found during the active stages of this disorder. The examination of the feces shows an excess of fat out of proportion to the amount taken in the food, a large amount of fatty acids and soaps.

4. The urine of these children also shows characteristic changes. The amount passed in twenty-four hours is large. There is a rise in the ethereal sulphates, a pronounced indicanuria and excessive phenol and the presence of large amounts of aromatic oxyacids.

Herter discusses the general indications for treatment of these patients. He finds gelatin particularly useful in increasing the weight.

Cases that undoubtedly come in this same class have been described by others, but without the careful laboratory investigations undertaken by Herter, which makes it impossible to classify them accurately. Thus, Huebner[1] publishes ten cases, some of which undoubtedly come under this classification, while Schultz[2] describes three cases.

Bramwell[3] described a case of what he called pancreatic infantilism. It was a boy of 18 years and 7 months, measuring in height 4 feet, 4½ inches, his weight being 67½ pounds, and having the appearance of a boy of 11, with a history of no growth since he was 10 years old. He was perfectly formed, bright, with a high-pitched voice, but with infantile

1. Huebner: Jahrb. f. Kinderh., 1909, lxx, Part 6, p. 68.
2. Schultz: Jahrb. f. Kinderh., 1905, lxii, 794.
3. Bramwell's Clinical Studies, 1903, ii, 348.

sexual development. He gave a history of chronic diarrhea for nine years, with five or six large, liquid, yellowish-brown movements a day.

Dr. Bramwell demonstrated that the boy's pancreatic secretion was defective and that there was still a chance for growth, as the epiphyseal lines were unclosed.

Under treatment with pancreatic extract for two years the boy showed remarkable improvement, a gain in height of 5⅞ inches, a gain in weight of 23¾ pounds, with a normal sexual development. It was found on omitting the pancreatic extract that the diarrhea returned.

Bramwell was thus convinced that there is one form of infantilism due to disturbance of the pancreas that can be cured by the administration of pancreatic extract.

In a later contribution[4] he records a case of a girl of 20 who had the appearance of a girl of only 14 years. There was no pubic hair and no evidence of cretinism. She was found dead on a road, and autopsy disclosed that there was a chronic endocarditis, a uterus 1 inch in length; no ovaries were found; the kidneys were fused, forming a horseshoe kidney, and a pancreas that was large and extremely fibrous. No report of a microscopic examination of the pancreas is recorded.

Two cases were reported by Dr. John Thomson,[5] which were shown at Dr. Bramwell's clinic, and thought to be of the pancreatic type of infantilism. No later report of the result of treatment, however, has been found.

This one case of Bramwell's, then, which was similar to those described by Herter, so far as their symptoms are concerned, was apparently of definite origin and readily curable.

AUTHOR'S CASES

I have seen recently four examples of this condition.

CASE 1.—The first case, a child now 4½ years old, has been under my care for twenty months. She had a history of never having done well. She had had repeated attacks of bowel trouble, from which she would convalesce only to be debilitated by a fresh attack. When first seen in August, 1909, she was suffering from intense general lassitude and would not willingly lift her head from the pillow. She would lie for hours without moving or speaking. Her mental development was very good but she evidently was lying thinking about her case all day, and after a physician's visit would repeat to the mother or nurse all that had been said about her case in her presence.

Her tongue was heavily coated, her abdomen was distended, she was markedly emaciated and somewhat anemic. She was having one or two very large, soft, gray, curdy movements, which would half fill the little chamber into which they were passed. Her appetite was very poor and she was put on a diet of peptonized milk with wheat flour gruel after an initial dose of castor oil. Bismuth was administered at each feeding.

4. Bramwell: Clinical Studies, 1907, vi, 175.
5. Thomson, J.: Tr. Medico-Chir. Soc., Edinburgh, 1903, xxiii, 165.

The examinations of the feces and urine were made by Dr. Herter and corresponded to the findings in his cases.

She was under the care of a trained nurse for eight months and was taken to different places at intervals for a change of air. Her diet was gradually amplified and food such as meat, which she vomited when first tried, she was later able to take. During these twenty months she showed practically no gain in weight although at the time of the present report she weighed 2 pounds more than she did three months previously.

No food had been found that appeared to increase her weight although the gelatin advised by Dr. Herter was tried, but an improvement that must precede all others was evident in her case. The character of her stools improved, the greatest improvement having followed the administration of buttermilk, of which she took a pint a day. Her movements became of good color, slightly curdy, and but one of moderate size each day. She became interested in everything that took place about her. She constantly used her hands, stringing beads and other like occupations, and she would walk a little, although walking was still distasteful to her. Recent examination of the urine and feces by Dr. F. C. Wood still showed the characteristic condition described by Herter.

Urine: Sp. gr., 1,018; quantity 1,240 c.c.; no sugar; no albumin; trace of indol-acetic acid; very strong Millon's reaction; very strong indican; no Ehrlich's aldehyde reaction. It contained 200 mg. of creatinin and 29 mg. of creatin.

Feces: Feces contained indol but no skatol was found except on one occasion. The organisms present were almost entirely Gram-negative, with enormous numbers of *B. aerogenes capsulatus*, and no noticeable bifidus. There were present many of the large, oval, highly refractile bacteria referred to by Herter. Trypsin[6] not present but erepsin was found.

The administration of intestinal antiseptics had no influence on the bacteria of the intestines. Under the administration of pancreatic extract she seemed to improve more than under other medication.

CASE 2.—A second case is that of a child of 2½ years that did well during the first ten months; at ten months it weighed 17½ pounds. In September, 1909, when 1 year old, after an attack of diarrhea, the weight fell to a little over 15 pounds. This child gained on two different occasions a pound or more, only to lose it again, so that at the time of the present report the weight remained about 15 pounds.

The child's stools, when doing badly, showed the characteristic gray color, and they always had a tendency to be loose. The child had an absolutely clean tongue, very little distention of the abdomen, and during a recent period her development had apparently been interfered with by the eruption of teeth, of which she cut seven in three months.

Examination of the feces and urine by Herter showed the characteristic condition, although there were some colon bacilli present in the feces.

This child did not gain on any modification of milk that was tried, and did not appear to do well on carbohydrates. Although she gained for a while on malt soup, she did best on a preparation of dried skimmed milk to which a moderate amount of fat was added in the form of cream. Afterwards when put on a mixed diet she gained for a short period. At 2½ years her weight was about the same as it was at 10 months.

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6. In testing for trypsin in the feces the only reliable method seems to be that using coagulated sheep-serum either in a Mett tube or a Petri dish. When this method is employed, trypsin is usually found in the stools of children. In two of these cases of infantilism in which tests were made only small amounts of trypsin were found. Erepsin, however, seemed to be abundant in the watery extracts of the feces from both of these children. The simplest test for this ferment is the rapid and complete solution of casein, applied according to Gross' method. In all of these tests the proteolytic action of micro-organisms was excluded both by controls and by thoroughly saturating the solutions while in the incubator with toluol.

CASE 3.—The child, 2 years and 5 months old, was a first living child after several miscarriages; birth weight 5 pounds, 2 ounces; did absolutely well with very little breast milk and accessory feedings of a cream whey mixture until 7 months old, when she weighed 15 pounds, 10 ounces. She then had an attack of vomiting, diarrhea and fever from which in a few days, however, she was better. She did not gain in weight and other similar attacks followed at intervals. A wet-nurse was obtained but still there was no increase in weight and there was practically none for many months although different sorts of food were used.

The examination of the feces by Dr. Herter showed the characteristic bifidus, which was very abundant in the fermentation tubes, as well as the *B. coli communis* and some cocci. The specimen of urine was unsatisfactory, as it had been mixed with the feces and was decomposed.

This then, was a case, like the second, which, while approaching this type, had not fully developed the characteristic condition a year prior to this report. Recently, without change in food or environment, the child began to gain in weight and developed normally, its progress being interrupted only by attacks of pyelitis.

CASE 4.—The child was seen by me first when 3 years and 3 months old. She gave a history of attacks of colitis, had a distended abdomen, and although at that time of proper height for her age, the diagnosis of her condition was easily made from her history and the character of her movements. Careful examination of the urine and feces by Dr. F. C. Wood corroborated the diagnosis.

Her history was that of a child difficult to feed. When 5 weeks old she had not recovered her birth weight of 7 pounds, 14 ounces, and a wet-nurse was employed. She then gained fairly until she was 6 months old, after which, under the same wet-nurse, probably with insufficient breast milk, she remained nearly nine months with a gain of only 1½ pounds. The wet-nurse was then discharged, the child was put on a condensed milk mixture, and gained quite rapidly, weighing more than 28 pounds at 2 years, while at 2¾ years she weighed 35 pounds. She had had a diarrhea the previous summer from which she had recovered at this time. When 2¾ years old she developed clay-colored movements and became irritable. When nearly 3 years old the fatigue became marked, so that she objected to walking and she became less interested in what was going on about her.

Then another attack of colitis ensued, which, after a two weeks' interval, was followed by another one, and she was removed in August from the seaside to the mountains, where she seemed to improve. On her return I first saw her.

The child measured 36½ inches in length and weighed 24 pounds. She had a moderate color, was slightly anemic, her tongue was heavily coated, her abdomen was distended, this distention being largely due to dilatation of the stomach to within ½ inch of the umbilicus. Her movements were large, soft, curdy, yellow and offensive. She had some inflammation of the drum of her right ear which, however, quickly subsided under treatment. The stomach gradually contracted down, but the tongue remained coated.

She was put on a careful mixed diet, limiting the fats and carbohydrates.

The stool was strongly Gram-negative. The examination showed the *Bacillus bifidus*, a Gram-positive streptobacillus, the *Enterococcus proteiformis* and the colon bacillus, and also the *Bacillus aerogenes capsulatus*. No skatol was found in the stool, although there was a considerable quantity of indol. The sulphate partition showed a total of 0.76 gm. of preformed sulphates, and 0.035 gm. of ethereal sulphates, both in terms of SO_3. The ethereal sulphates were, therefore, about 1 to 20, which is within the normal limits.

The urine gave a strong indol-acetic reaction, showed a trace of indican, no reaction for aromatic oxyacids, and no Ehrlich aldehyde reaction.

Five months later the child came again under my care, having gone through the winter without any attacks of colitis, and it was then ascertained that for one year she had shown no growth. She had increased in weight at one time to 26 pounds but weighed now only 24½, and she was brought to me then because

she was more fretful and because she complained of some pain in the buttocks and abdomen. She had in the interval been somewhat constipated but now was having frequent, soft, large, gray movements. Her tongue was somewhat coated and the stomach was dilated as when she came to me before. The large intestine was apparently not distended. She was thin and flabby but always had pink cheeks.

After castor oil, rhubarb and soda and a diminution of the amount of food taken, her stomach resumed its normal size in a week or ten days.

The urine, of which she passed 520 c.c. in 24 hours, was clear, pale, acid and had a specific gravity of 1,020. Millon's reagent gave no reaction of oxyacids; there was a faint trace of indol-acetic acid, there was no indoxyl and no Ehrlich's aldehyde reaction. A determination of creatin and creatinin was made and it showed an abnormal proportion between the two.

A later determination of urine and feces showed the following:

Urine: 670 c.c. in twenty-four hours, specific gravity 1,016, no sugar, trace of indol-acetic acid; very faint Millon's reaction; no Ehrlich's aldehyde. There was an excess of creatin.

Feces: The stool was dominantly Gram-positive and contained large numbers of the *Bacillus aerogenes capsulatus*, and some of the large oval, highly refractile bacteria referred to by Herter. There were also many Gram-negative organisms. Trypsin was present in fair quantity; also abundant erepsin. Indol, but no skatol was found.

The child was put on a pancreatic extract in fairly large doses, and showed improvement in the character of the stools and lessening of the abdominal pain, but did not show any material gain in weight.

The real nature of this disturbance is a matter of speculation. Dr. Herter expressed himself to me as feeling that it might be due to some lack of function in the pituitary body, and to determine whether this might be the case radiographs have recently been made in some cases, but with, so far as I know, negative results. To me it has seemed more likely that it was due to some damage to a part of the digestive system that has to do with the absorption of food. These patients have good appetites, take food and water eagerly, but have the large, poorly digested movements, with a great waste of fat.

In one case, at least, resembling these, that of Bramwell, the use of pancreatic extract seemed to be curative. But although this case was published in 1904, no reports of other cures from the use of pancreatic extract have been made. There were also two other cases of Dr. John Thomson's referred to as probably due to pancreatic disease and concerning these I find no published record of a cure.

These cases might be thought of simply as stunted growth, but it would seem to me, considering the previous history of diarrhea, the evidence of intestinal putrefaction, with the peculiar flora of the intestines, and the high ethereal sulphates in the urine, that the lack of growth is really due to an intestinal condition that interferes with a proper absorption of food in the bowels, and this interferes with an increase in weight.

It has been well shown by Fleischner[7] that in children under 2 years of age, failure to gain in weight is accompanied by a failure in proper growth. Thus Fleischner found that the average length of a baby weighing 9 pounds at 1 month is 22 inches, and at 7 months it is 23¼ inches, an increase of only 1¼ inches, while the normal gain for these seven months is some 5 inches in length, this being one-fourth of what it should be in a normal child. A 12-pound baby at 3 months measures a little more than 25 inches in length; at 12 months it measures only 26 inches instead of 29 inches, a gain here of only one-fourth of the normal increase in length. Thus the failure to absorb from the intestine would seem to explain both the failure to gain in weight and length.

CONCLUSIONS

The intestinal infantilism of Herter is not a very infrequent condition in young children, who for a considerable period will not grow or gain in weight, although the hygienic surroundings, feedings and supervision are most carefully managed.

These children have characteristic symptoms and characteristic, abnormal intestinal flora, as well as equally characteristic changes in the urine.

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7. Fleischner: Arch. Pediat., October, 1906.

MYATONIA CONGENITA: A REPORT OF A CASE WITH AUTOPSY *

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Oppenheim[1] described in 1900 a remarkable disease in children the chief symptom in which is a hypotonia or even atonia of the muscles, combined with a corresponding diminution of the tendon reflexes. There is limitation of active movement varying in degree. In the most marked cases the extremities lie motionless and apparently paralyzed. On close observation contractions may be brought out in some or many of the muscles, but these are weak and without locomotor effect. In one of his cases the affection involved not only the muscles of the extremities, but those if the neck and trunk also. The condition is always more marked in the lower than in the upper extremities and the muscles supplied by the cranial nerves are not affected. Electrical stimulation shows a quantitative diminution of contractility up to its complete disappearance. There is no reaction of degeneration and no loss of sensibility. The joints are abnormally movable owing to the flaccidity of the muscles. It is a congenital affection, but it does not usually attract attention immediately after birth. He considers that it consists essentially in a retarded development of the muscles, and it tends to betterment or recovery. He did not, however, exclude the possibility of an involvement of the nerves or of the anterior horn cells. The muscles may be flaccid and soft, but they are never atrophied.

CASE.—*History.*—M. G., aged 6 months. The father was addicted to alcohol and was intoxicated at the time of conception and at intervals during the mother's pregnancy. During pregnancy the mother was well, but much worried and distracted over her husband's condition. There have been no miscarriages. The child of a previous pregnancy is healthy. The previous history of the mother is negative. The child, male, was born normally April 3, 1910. Fetal movements were felt during pregnancy and were quite as lively as those of the normal baby of the previous pregnancy. When the baby was three weeks old, the mother noticed that he seemed unusually limp, but was re-assured by the obstetric nurse in charge. When six weeks old, the mother noticed a dropping of one hand and that the hands seemed weak and limp and were not moved as freely as they ought to be. At this time she consulted a physician who said the condition was due to weakness, that the breast milk was probably not agreeing with the baby and advised that it be taken off the breast. When the baby was two months old he was seen by Dr. Howland of New York who noted a marked atrophy of the muscles of the trunk and extremities, and deformity of the chest. The baby seemed to improve somewhat, at one time being able to move his arms, but later

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this power disappeared. He has never been able to move his legs at the hips, knees or ankles, but could make slight movements of the toes and fingers. He has never been able to sit up or to hold up the head. The mental development is normal. The breathing has been labored since the baby was three weeks old and this has grown progressively worse. On September 3 the baby caught cold and since then the trouble in breathing became worse, with choking spells from mucus accumulation. To give relief the adenoids were removed on September 24. The breathing was somewhat improved by the operation, but has lately become as bad as before. The weakness increased until he could no longer nurse from the breast or bottle and has to be fed with a spoon. The baby gained weight up to the time of the adenoid operation, but since then has lost.

Physical Examination.—October 3. Poorly developed and poorly nourished baby. The cranium was square, the forehead prominent; the fontanels depressed but of normal size; the mouth, tongue and throat were normal. There were no teeth. The pupils were equal and reacted normally. The respiration was irregular, labored and wholly diaphragmatic, but not notably accelerated. The chest showed marked increase in anteroposterior diameter. The heart, lungs, and abdomen were normal. The baby was entirely unable to hold up his head and there seemed to be a complete flaccid paralysis of the trapezius muscle. The upper extremities were not moved at all from the shoulder and very feebly at the elbow and wrist. The hands hung over in flexion when the arm was held upright. There appeared to be a flaccid paralysis of the shoulder girdle muscles with marked atrophy, particularly of the pectoralis. There was slight atrophy of the muscles of the extremities. The knee-jerk was absent.

From this time until death, October 23, the condition gradually became worse, although there were temporary ameliorations. There was increase in the mucus accumulations and in the fits of choking, and the child died in one of these attacks.

Autopsy.—The body was that of a somewhat emaciated, male infant; the body length corresponding to age; the weight below the average; no rash on surface of the body; all the tissues were very soft and flabby to the touch; no rigor mortis; all the joints were extremely flaccid and movable. The bones of the extremities were easily felt through the soft tissues; no edema; the skin was normal. The subcutaneous fat was small in amount, soft and somewhat edematous. The muscles of the neck were thin but of normal color and consistency. The pectoral muscles and all the muscles of the back and extremities greatly atrophied. The atrophy did not affect the abdominal muscles to so great a degree. The pectoralis major was reduced to a small fascia-like band. The color of the atrophied muscles was grayish and translucent. They were more succulent and the single muscles were not easily dissected out. They seemed infiltrated with fat and fused with the surrounding connective tissue. The intercostal muscles were reduced to thin gray sheets. The abdominal muscles, though thin, had a better color than the others. The large muscle masses alongside the vertebræ were reduced to thin bands less than 1 cm. in diameter. There seemed no change in the nerves. They were of normal size and appearance and more prominent than is usual. The thorax was misshapen. The antero-posterior diameter was greatly diminished; the cartilages and ribs passed almost backwards from the sternum, then took an accentuation of the normal curvature, giving a flat depression in the antero-lateral situation. The lower border of the thorax flared outward like the mouth of a bell. The diaphragm was of normal color, thickness and consistency. It seemed rather better developed than normal.

The tongue, pharynx, larynx, and trachea were normal; the tonsils and lymphoid tissue of the tongue and pharynx of a development corresponding to age. All the lymph-nodes of the body were prominent. The thyroid gland was small but of normal appearance. The thymus was large, of normal color and consistency. It projected 8 cm. below the sternal notch and weighed 29.2 gm. The heart weighed 36 gm., and in all respects was normal. The aorta and other

large vessels were normal with the exception of the left femoral, in which there was an occluding, fresh thrombus just below the origin of the profunda.

The entire upper lobe of the left lung and the upper posterior portion of the lower lobe were completely atelectatic and dark red in color. Nearly the entire upper lobe of the right lung was in same condition. There was no evident pneumonic consolidation, but all portions of the atelectatic lung sank in water. In the bronchi there was a small amount of muco-pus. The lower lobes of both lungs were normal; pleura normal; all the abdominal organs normal, as also were the brain and spinal cord on naked eye examination.

Diagnosis.—Anatomical diagnosis at autopsy, atrophy and degeneration of muscles, deformity of thorax, atelectasis of lungs, hypertrophy of thymus, fresh thrombus of femoral artery.

HISTOPATHOLOGY

The Muscles.—Portions of the various muscles were hardened in Zenker's fluid, liquor formaldehydi (formalin) and in Orth's fluid, sectioned in paraffin, and stained in methylene blue and eosin, in phosphotungstic hematoxylin and by the methods of Marchi and Weigert-Pal. All of the muscles affected showed the same changes though in a varying degree.

Cross section, hematoxylin and eosin: Section through some of the most altered muscles of the leg, with low power, shows the fibers arranged in well ordered fasciculi. The amount of connective tissue is increased. With low power, two well-defined masses of tissue can be seen. There are fibers which present the usual appearance of normal adult muscle. There are also masses of what seem to be accumulations of cells which are also arranged in fasciculi, but the masses are very much smaller than are the masses of normal muscles. Similar aggregations of cells are seen often at the periphery of a single muscle fasciculus. Occasionally, in the middle of the masses of small cells, single muscle fibers of the average size can be made out. At various places there are sections that appear to be the muscle spindles, that is, several muscle fibers enclosed in a definite capsule of connective tissue. The muscle fibers in the spindle vary greatly in size and the nuclei often show a central position.

Under the immersion, the larger fibers for the most part appear to be normal. Occasionally, the nuclei are found in the center of the fiber. What appeared under the low power as masses of small cells are seen to be composed of very small muscle fibers. Although most of these fine fibers are arranged in fasciculi, they are also found in the midst of the larger fibers and surrounding the groups of these. In the large fibers there is considerable variation in size, and they are usually round or oval. Many of the large fibers are vacuolated, containing either a single large vacuole, or several small ones. Some of these vacuoles contain a small amount of finely granular material. The largest fibers in this muscle are almost invariably definitely round. Occasionally, especially at the periphery of the muscular mass, fasciculi are found which seem to be midway between the larger muscle masses and the small fibers, but in general there is a sharp distinction between the two. With phosphotungstic hematoxylin there is a great variation in the muscle stain, some of the fibers being very much darker than others. The muscle fibrillæ are not well stained. In the fine fibers the fibrillæ are rather more prominent at the periphery of the fibers. On the longitudinal section of the muscles tissue, taken from about the same region, the same arrangement of the fibers can be distinguished. The cross and longitudinal striation is apparent in both sets of fibers, but more strongly marked in the larger fibers. The nuclei in the small muscle masses seem to be extremely numerous. They are of about the same size as in the larger fibers. Many of the fibrils are so small that when the section passes through a nucleus this occupies the whole extent of the fiber. The apparently great number of nuclei is due to the number of the fibers. When a single fiber is followed along, the nuclei are not more closely set than they are in the large fibers. The cross striations in a number of measurements are nearly the same distance apart in both the large and fine fibers. The length of the fine fibers could not be easily determined either by section or by teasing. They are

never so definitely parallel to one another as in the large fibers. The masses of the large fibrils in longitudinal section are perfectly straight; the masses of the smaller fibrils present a wavy appearance as though they had not contracted at the same rate as the larger fibers. Most of the small fibers are solid and they do not present the appearance of embryonic fibers. Occasionally, however, fibers are seen which are hollow with fibrillæ at the periphery presenting much the appearance of embryonic fibers, and a fiber solid throughout most of its course may present an area where it has hollowed out. They also occasionally present swellings along their course, but as a general thing they preserve the same diameter.

Size of the fibers.—Measurements were made of groups of the larger fibrils, taking those of both the largest and smallest diameter. The average diameter obtained by taking the longest and shortest diameters in a group of fifteen adjoining fibers is 19.2 microns. The largest fiber found in the interior of the group is 35 microns. The average diameter of another group of fibers is somewhat more, 23.75 microns. In a small group of 22 fibers, there is a variation in the sizes of the fibers which belonged to the class of large fibers of from 8 to 20 microns. The average diameter of a group of twenty-seven of the small fibers, only one diameter being necessary on account of the prevalent round shape, is 3 microns with a variation of from 1.5 to 3.5. In the longitudinal sections, fibers are found from 1.5 to 4 microns in diameter. On comparing the cross striations, taking two adjoining fibers of the large and small group, there is a difference in the distance between Krause's lines, this being from 1.8 microns to 2 microns in the large fiber and 2.4 microns in the small, this being evidently due to a difference in the degree of contraction. This difference did not always hold, but a number of careful measurements showed in other places slight differences in the distance between the lines. Here and there among the small fibers in the longitudinal sections, single fibers are seen which show neither longitudinal nor cross striation. In these fibers there are here and there sarcous elements in the shape of double dots and occasionally rows of a half dozen or more of such dots separated by the usual interval between Krause's lines. Comparison of these fibers with the fibers of the diaphragm show that the average of the diameter of the diaphragm fibers is the same as the large fibers in the affected muscle. A study of the muscle by the Marchi method shows changes more marked in the large fibers. There is no general fatty degeneration. Single very small fat drops were commonly present, and in certain fibers there was a large amount of fat. The largest amount of fat was found in the otherwise unaltered muscle of the diaphragm. In the small fibers it was exceptional that any fat whatever was found. A study of the connective tissue in the muscle showed that this was relatively increased, but it is uncertain whether there is an actual increase in this tissue. There is no evidence at any point of any active cellular changes in the muscle. There are no phagocytic cells and no foci of lymphoid cell infiltration. The blood vessels in the muscle are normal, but of small size. The vascularity seemed small, relative to the amount of tissue.

An attempt at comparison of the size of the muscles here with those of children of the same age led to nothing of importance owing to the extreme variation in the size of the muscles in varying conditions of nutrition. Thus in a greatly emaciated child of six months, the average size from the measurement of 112 fibers of the Sartorius muscle was 5.1 microns. Measurement of the palatal muscles of a well nourishel infant at birth gave an average diameter of 17 microns; and the muscles of the larynx in a premature infant of seven months an average of 9 microns. We cannot definitely decide whether the size of the large fibers in this case varies from the normal, but probably it does not.

The nervous system.—Numerous sections made of the cortex, the cerebellum, the pons and medulla, and stained by the usual methods, showed in all respects a normal tissue. Sections of the cord at various levels, show very slight evidences of change. There seems no diminution in the number of cells in the anterior columns. The amount and distribution of the neuroglia is normal.

The Marchi stains show very slight degeneration of the myelin in the posterior columns. The degree, however, was so slight that in the routine examination of the cord it would probably have been unnoticed. The same applies to the anterior and posterior nerve roots, and to the spinal ganglia. In the Nissl stains of the cord, no certain evidence of cell degeneration can be made out. Sections were made of the sciatic nerve at various levels which were stained by the Marchi and Weigert methods and with hematoxylin and eosin. Here and there the sections stained by the Marchi and Weigert methods show very slight irregularity in the myelin. In single fibers there is a slight stain with the Marchi. There are no cellular changes in the nerve whatever. The examination of the nerves in the muscles show more marked changes. There are nerve bundles which are in all respects normal. The number of nerves, taking the whole mass of muscle, seems to be diminished, and among the fasciculi of small fibers, nerves are found which show evident degeneration and loss of myelin. A careful examination by the Weigert method leaves little doubt of the diminution of nerves in the changed muscle, that is, relative to the number of fibers. In these muscle fibers, no evidence is found of the terminal distribution of nerves to the single fibers. More or less definite nerve endings were found, however, among the fibers of normal size. Various branches of the sympathetic nerves which were found on the examination of the viscera, and branches of the pneumogastric nerves, were completely normal.

Sections of the atelectatic upper lobes of the lungs show congestion, atelectasis, edema, with small foci of bronchopneumonia. In the exudation here, a few diplococci conforming in morphology to pneumococci are found.

The myocardium is normal. An examination of the thrombus in the femoral artery shows this to have the usual composition of an acute thrombus, being made up of blood plates, fibrin, red corpuscles, and leukocytes. There was no examination of the blood made during life, but that within the vessels after death appears normal in the character and relative numbers of its cells.

The bone marrow of the femur shows a normal, active marrow.

It is very much regretted that there was no examination of the thymus. In the numerous pieces of tissue taken for examination, this was in some way lost. The numerous sections of the lymph-nodes show these to be normal with the exception of the almost complete absence of the germinal centers. The spleen is hyperemic, the follicles prominent, and in the germinal centers of these, almost without exception, there was extensive necrosis of a type exactly resembling that so commonly found in diphtheria. Microscopic examination of the liver, pancreas, adrenal, kidneys, intestinal canal and thyroid shows these organs to be normal. In the thyroid there is the usual amount of colloid.

ABSTRACTS OF CASES FROM THE LITERATURE

In view of the rarity and the interest of this disease, it seems worth while to give short abstracts of the cases hitherto reported.

MUGGIA.[2] Female child, family history negative. Pregnancy and birth normal. Directly after birth the child seemed normal. It cried, passed meconium, nursed and urinated. After a few days it was noticed that the child moved neither the arms nor legs. On observation, nutrition, size, weight and organs were normal. The limbs showed an absolute lax paralysis. The sensation of skin was normal. The superficial reflexes and the patellar reflexes were normal, but weakened. The electrical reaction of both nerves and muscles was not diminished. After four months' observation, there was no change in the condition and child continued to develop normally.

BATTEN.[3] These three cases reported by Batten, the first case following Oppenheim's articles, are properly considered by Collier and Wilson to belong to the group:

CASE 1.—Male, age about 6 years; the third of four healthy children; never stood; could sit up but not kneel; was intelligent; on examination was thin and

small; could get into sitting position; progressed by rolling over and over; no localized atrophy or hypertrophy; all movements could be performed with arms; unable to extend legs or to flex legs on abdomen; extensors and flexors of foot were fairly good; abdominal and dorsal muscles were weak. Contraction could be obtained in most muscles on strong stimulation, but not in quadriceps or gluteal.

CASE 2.—Male, age 7, small at birth, legs always contracted; never able to walk. On examination limbs were thin and wasted; long hands and feet; face somewhat expressionless, eyes prominent, facial muscles act; unable to walk; arms thin and wasted; muscles small; all movements could be performed; legs thin; knees could not be straightened owing to contraction of ham strings. Most movements could be performed, but legs could not be extended; knee-jerks absent; all muscles reacted to a moderately strong faradic current.

CASE 3.—Female, aged 6; could not stand or sit up, but could remain in sitting position; could always move both legs and could pick up small things with either hand; was intelligent. On examination, small for age, eyes prominent, sat up if placed, or lay on back with knees flexed; feet and hands appeared long; knee- and hip-joints could not be fully extended; muscular wasting general; muscular sense normal, knee-jerk and plantar reflex absent.

SCHULLER.[4] He demonstrated a child, male, age 19 months. The child was weak from birth. It learned to sit up and stand. After ten months, it was no longer able to stand nor to sit upright. On examination in addition to slight symptoms of rickets, there was a high degree of hypotonia of the muscles of the lower extremities, but without evidence of atrophy. There was absence of the deep reflexes; diminished electric excitability; active movements of legs could be carried out in but slight degree.

SPILLER.[5] Male, aged 22 months. The condition was first noted at five months; has never been able to hold anything in hand; at entrance into hospital child was well developed for 20 months old; muscles not wasted, but soft and flabby. The limbs were moved voluntarily at all joints, but the movements were very weak. There was a remarkable range of passive movements of legs, the feet could be placed behind the head while the front of thigh was in close contact with the trunk. There were no patellar or tendon reflexes; irritation by pin caused motion. The child had been constipated since 2 months old, which was attributed to weakness of the abdominal walls. The muscles reacted to the faradic current. Autopsy: No rigor mortis; muscles flabby. On cutting into calf muscles a great deal of subcutaneous fat and little pale muscle tissue were found; in sole of foot muscle almost absent. Microscopically the muscle fibers were small and those from the foot smaller than those from the back. The transverse striation was normal, the longitudinal not so well marked. The brain, spinal cord, and nerves were normal; no degeneration by Marchi stain. Spiller regards an arrest of development of the muscles the essential pathologic condition. Smith gives a subsequent report on the examination of the thymus.

OPPENHEIM.[6] Child (sex not stated), aged 1 year and 7 months; no hereditary trouble; soon after birth it was noticed that the child could not move its extremities though all the muscles supplied by the cranial nerves were normal. When 9 months old some movement of the arms was obtained, but the legs remained completely lame. The child was well developed and nourished. There was slight reduction in the volume of the muscles, which had a peculiar doughy feeling. There was diminution in the muscular tonus; the tendon reflexes in the legs were abolished, and the muscles did not respond to mechanical or electrical stimulation, with the exception of some feeble contractions in the peroneus.

BERTI.[7] CASE 1.—Boy, 3 days old. Two days after birth it was noticed that with the exception of the eyes, lips, tongue, and head, there was no motion. He lay with stretched limbs, crying weakly. The breathing was shallow and frequent, of diaphragmatic character. All the muscles of the extremities and the trunk with the exception of the diaphragm seemed to have no function. There

was complete atony of the muscles. After three weeks the respiration was deeper. On stimulation there was slight motion of one arm. Subsequent history unknown.

CASE 2.—Girl, 5½ years old. On the day after birth it was noticed that the child, otherwise normal, seemed to show no life in the body with the exception of the head. After three weeks there was slight motion in one arm and in some of the fingers. After a year and a half the child could lift up the arms and there was slight movement in the legs. This condition lasted until 5½ years old, the child becoming emaciated. Now all movements are carried out slowly. She stands with legs spread out. The muscles are soft and relaxed. The electrical stimulation is diminished; knee-jerks sometimes doubtful; easily exhausted; no alteration in sensation, no sphincter trouble.

KUNDT.[8] Child, 18 months old. No hereditary trouble; two other children are normal; the pregnancy and birth were normal. The fetal movements were felt just as in the other pregnancies; mother noticed no movements of feet from the first; after six months there were movements of feet and lower limbs; thighs remained motionless; child could sit up, but could not stand. The arms were normal. The child was well nourished; subcutaneous fat abundant; the muscles were extremely lax on palpation. All passive movements of the hip joints easily carried out, but some opposition to extension of lower leg. The knee-jerk was absent. The Achilles reflex appeared on the left, but was imperfect on the right. Electrical stimulation produced contraction of the lower legs. After three months' observation a slight improvement was noticed. There was never reaction of degeneration.

ROSENBERG.[9] Male, 2½ years old. Family history negative. Mother did not feel fetal movements during pregnancy. Pregnancy and birth normal. Child nourished by bottle. The arms, head, face, and eyes moved normally. The child sat up at seven months. At eleven months on attempting to stand there was no strength in knees or hips. Child at time of report could not stand or walk. In other respects it was normal. The upper and lower legs could not be moved. The feet and toes could be actively moved. When a leg was lifted it fell as a dead weight. Contractions in the apparently paralyzed muscles were produced by pain. The legs showed no atrophy. There was entire absence of muscle tone and very extended passive motion could be made. The feet could be brought in contact with the ears. Palpation showed a decided difference between the affected and the normal muscles, the former having a soft doughy feeling. There was absence of knee and Achilles reflexes. There was complete absence of electrical reactions in the gluteal, in the quadriceps and in the adductors. In the lower leg only the peroneous gave a reaction. After six weeks' faradic treatment some improvement was noted.

IOVANE.[10] Male, aged 3 months. Family history negative, normal pregnancy and delivery. Child appeared healthy and took the breast. On the first day it was noticed that there was no voluntary movement of the arms or legs and that the head rolled about on the trunk. When seen at three months, there was flaccid paralysis with absolute atony of muscles of arms and legs; feeble movement at wrist; muscles of trunk atonic, only abdominal reflexes present; slight response to faradic current, none to galvanic. Child died at five months with bronchopneumonia.

SORGENTA.[11] Both children by the same mother. No movements during pregnancy. In both clinical history about the same. Both well developed at birth and from birth unable to move arms or legs; absence of cutaneous and deep reflexes; no reaction in muscles of legs; weak in arms. Death in one on fortieth day, in other on fifteenth day. In both cases convulsions preceded death. No autopsy.

These cases of Sorgenta have been excluded by Collier and Wilson, chiefly in view of its familial type and classed with the myopathies.

COMBY.[12] Male, aged 8 years. When seen first in September, 1905, could neither walk nor stand; kyphosis on sitting; intelligence good. The only defect

was in the muscles, which were soft, but not atrophic; could move legs but they were not strong enough to support him.

CATTANEO.[13] Female, aged 4 months. Birth normal. Fetal movements not felt. Breast fed. After birth it was noticed that the child could not move hands or arms. Father thought it could move arms at time of report. Could not hold head up. Observation showed a well nourished child; only slight movements of hands and feet; cutaneous and deep reflexes absent; electrical reactions diminished.

BING.[14] Male, 3½ years old. A typical case. It was at once noted that the legs were passive appendages to the body and could be moved readily in all directions. A normal birth. Congenital bilateral pes varus. Great weakness of muscles since birth. Child could neither stand nor walk. Arms could be moved, but movements weak. Head could be held but a short time in one position. Knee-jerks absent, no disturbance of sensation or of sphincters. Bing removed a piece of muscle but does not state from which part and found it normal, although there might have been some question whether the nuclei were not more abundant than normal. He questions whether the condition is to be regarded as functional or due to a non-development of the spinal cerebellar tract which governs the tonus.

TOBLER.[15] Male child, the first born. First observed at 20 months and under observation three years. Fed on breast for six months. From the first the loss of motion was striking. Examination at 20 months showed a well nourished child. All extremities in condition of complete atony but no paralysis; some motion in arms but slow and weak. Atony even extended to facial muscles, but the movements of tongue and eyes were normal; electrical stimulation greatly diminished and in part lost; sensation not affected; intelligence good; no change during continued observation for three years. Death probably from diphtheria at 5 years. No observation as to fetal movements.

VARIA AND DEVILLERS.[16] First child; fifty-nine days before birth mother fell and was laid up with periostitis until eight days before birth. During pregnancy, both before and after the accident, fetal movements were felt; child under observation for nine months; female child; arms and legs immobile; all the muscles abnormally flaccid. The head rolled about indifferently when not supported. There was spinal kyphosis when child was seated, which disappeared on lying down. Death from bronchopneumonia when 9 months old. (Pieces of muscle and cord were sent to Dejerine for examination but no report has been published.)

COMBY.[17] Male, aged 4 months. When one month old the child had an attack of diarrhea and it was then noticed that the muscles were paralyzed. When examined, legs immovable; no muscular wasting; knee-jerks absent; no support for head; electrical reaction showed hypo-excitability of right leg; no reaction of degeneration. After a year muscular atony persisted.

CARY COOMBS.[18] Female, aged 10. Flabbiness of one hand noticed one-half hour after birth. Nothing further was noticed until time to walk. Then it was found that the legs would not support her; could not walk by herself until 2 years old; arms most affected; ankles often turned causing her to fall; extraordinary flaccidity of all joints; knuckles could be made to touch the back of the wrist; lower limbs very hypotonic, but not so much so as upper; knee-jerks and tendon reflexes were present; electrical excitability was diminished. Muscles could be distinctly felt, but they were small, soft and doughy.

LECLERC.[19] Female, aged 4 years. Mother felt fetal movements as in the case of her other children. For the first days the child appeared normal. A bronchopneumonia developed at 6 weeks of age and after this the paralysis was observed. The child then appeared completely paralyzed, incapable of making any movements of extremities. Head falls on shoulders when moved. From this time a slow but progressive improvement took place. At the time of the report the child could move the limbs, but the movements were feeble. Not a true paralysis, but muscular atony. The face and all muscles innervated by cranial nerves were

normal. The passive movements of the joints were greatly exaggerated. The muscles were not atrophied, but seemed extremely soft. The intelligence was slow in developing.

BAUDOUIN.[20] Child, 4 months old, female. Pregnancy and birth normal. Since birth neck, trunk, arms, and legs were immobile. Muscles supplied by cranial nerves normal, except for slight internal strabismus of right eye; complete flaccid paralysis in trunk and limbs with the exception of feeble movements of fingers and toes; absence of deep reflexes; respiratory muscles were affected. The thorax dilated very slightly during respiration. Faradic excitability was diminished. Death from bronchopneumonia. (Baudouin says that the disease tends naturally toward recovery and if cases are met with early a complete recovery is possible, which is somewhat at variance with the results of his autopsy.) He found in the cord at the level of the eighth cervical segment that the cells of the anterior horns were diminished in volume but there was no evidence of neuron phagocytosis. He thinks there is probably an arrest of development. Section of the anterior and posterior nerve roots showed the anterior four or five times smaller than the posterior. The posterior stained more deeply than the anterior. In the anterior root the sheaths were more widely spaced and separated by amorphous tissue. Sections of the sciatic nerve stained with Marchi showed no fragmentation of the myelin. In sections stained by Weigert's the nerve was not well stained, the myelin sheaths were thickened and not equal in number in the different bundles. He concluded that with the myelinated fibers there were numbers of nerves not yet myelinated. The same lesions were found in the crural, cervical and median nerves. The condition in the nerves was not a neuritis but an arrest of development and a retardation of myelin formation.

The muscles presented very profound lesions, varying little according to the muscle examined. The connective tissue sheaths were numerous and thickened. The vessels were normal, but often surrounded by young cells. The muscular fibers were much changed. There were masses of small fibers from 6 to 8 microns in diameter and along with these very large fibers often reaching a hundred microns. The nuclei were increased in number and often lay in the interior of the fibers. The striations were normal and there was no degeneration. The diaphragm was the least affected. The skin was normal, the lungs showed disseminated bronchopneumonia. There was slight sclerosis of spleen with follicles more accentuated than normal. The thyroid gland was sclerosed and contained no colloid. There was sclerosis of the thymus with small Hassall's corpuscles. The condition was due to some cause which had suspended the development of the marrow and the nerves, and through these changes the muscle had become affected.

AUSSET.[21] Female child, 2 years, 9 months old. Mother had five children, two born dead. No fetal movements during pregnancy. After birth the mother noticed that the child was unlike others. It was inert and lay five or six hours without demanding the breast; did not move limbs even when crying; there was slight movement of arms. At 18 months there was some febrile disturbance and at two years whooping-cough. On observation, nutrition appeared good; fat abundant on lower legs; slight movement of arms; legs immovable; no actual paralysis; when leg was lifted it did not drop as rapidly as would a paralyzed leg. The joints were not abnormally movable. The left leg was smaller than the right. The electrical reactions were normal.

BRUNARD.[22] Child aged 2 years. External appearance was that of a well nourished infant rather deficient in fat. No hereditary trouble. Birth normal; fetal movements felt; breast nutrition. At the age of 2 months there were convulsions which had not reappeared. The first teeth were late in appearance. The attitude was striking. The child lay on her back, the legs flexed on the thighs, with total abduction. The extremities could be moved, but the child could not take hold of an object; could not walk; gave picture of child sitting down, the body bent forward, the face on the ground between the feet. The patellar reflex was absent; electrical reactions did not appear to be diminished; no trouble with

respiration, circulation or digestion. The child was idiotic. (In this last the case departs from the type, since all the other cases showed normal intelligence.)

COLLIER AND WILSON.[25] CASE 1.—Boy aged 4. Normal pregnancy and birth. No mention of fetal movements. At birth well-shaped but thin; breast fed. The position assumed naturally from birth was one of flexure of hip and knee and extreme dorsiflexion of ankle; legs and arms weak and limp; could not hold head erect. On examination, a small, thin, soft, limp child; muscles small and absolutely atonic, the joints so relaxed that the limbs could be placed into all sorts of fantastic positions without discomfort. The muscles have a soft, velvety feel. A limb held up by its proximal end can be shaken like a flail. There was contraction of the iliopsoas, adductors, and ham strings on both sides. With this restriction, all voluntary movements could be performed quickly and with normal range, but the power was very feeble. The vertebral column bowed in the sitting posture but the curve disappeared when the child was held by the shoulders. The soles of the feet were almost flat, soft and like long pads. Faradic and galvanic excitability was lowered. The deep reflexion without exception were absent.

CASE 2.—Boy, aged 7. The mother was weak in the limbs when a child, and several members of her family could not close the eyes properly. Birth normal. No mention of fetal movements. Soon after birth it was noticed that the child was unnaturally limp and could not hold up his head; had never been able to walk; slow improvement since three years old. On examination, head large, facial muscles weak, inability to close eyes properly; universal flaccidity and weakness; the muscles were soft and weak; impossible to differentiate muscle from adjoining tissue by palpation. All muscles contracted voluntarily, but too feebly to do any useful act. All reacted to faradic current. Child had a peculiar triangular face and open mouth which may have been due to maldevelopment or to muscular contraction preventing the full growth of the mandible. The superficial reflexes were normal, the deep entirely absent. There had been gradual improvement and when last examined the child could walk a little without support.

CASE 3.—Boy, aged 5½ years. Family history negative. Child breast fed. Nothing noticed for six months with the exception that the child placed his limbs in extraordinary positions. After this the mother noticed that the legs were weak. He finally was able to stand when holding on to something; then became weaker and weaker in the legs. On examination, a pale, thin child, of average height; intelligence good; no difficulty in speaking and swallowing. Muscles of upper extremities were small but all voluntary movements could be performed. There was absolute hypotonia of all the muscles, with relaxation of the ligaments and flail-like joints. Muscles of the neck and trunk were thin and weak. He could raise his head only when lying in the supine position and sat up with difficulty. In the lower extremities there was slight contraction of the flexors of the thighs and decided contracture of the muscles of the feet. The faradic excitability of the muscles was diminished. The superficial reflexes were normal; the deep, entirely absent. Continued improvement occurred.

CASE 4.—Girl, aged 1 year, 8 months. Family history negative; pregnancy and birth normal; fetal movements felt; breast fed; child normal until 12 months old. At this time she was ill for a month with an attack of bronchitis. At end of illness it was noticed that she could not move her legs; arms not affected. On examination, a thin but otherwise fairly developed child; motion of upper extremities normal, but weak and flaccid; the muscles of the lower extremities were absolutely atonic; movements very weak; considerable voluntary control; a flail-like condition of the joints; the deep reflexes were absent; the faradic excitability was diminished. After being at the hospital for three months marked improvement in the power of all muscles was noticeable. (The cases of Collier and Wilson are rather different from the other cases which have been reported, in the age of the patients, in the slighter degree of the muscular involvement, and the time after birth of the development of the condition.)

GASTONGUAY.[24] Child aged 3 years and 8 months. Mother perceived no fetal movements; nothing abnormal noticed for six weeks; then after a pulmonary attack the child appeared completely paralyzed with the exception of the face and pharynx. Child nursed and drank perfectly. When seen there was no complete paralysis, but atony of the muscles. This atony extended to the ligaments, rendering the joints much more flaccid and giving greatly exaggerated passive motion. The muscles did not seem atrophied but were much softer than normal. All muscles enervated by the cranial nerves were intact. The skin was not very supple, that of the lower extremities showed a hard, smooth edema. The mental development was retarded. Slight improvement occurred while under observation.

LEREBOULLET AND BAUDOUIN.[25] Child, aged 11 months. Flaccid paralysis having its maximum in the muscles of the neck. Head rolled unsupported. The extremities were equally affected; reflexes diminished but not abolished. Death, with fever and dyspnea, due to a beginning pulmonary septicemia. Convulsions were seen and during these the flaccidity gave place to contraction. Autopsy: The cord and brain were examined by methods of Nissl and Marchi. These were found normal. No diminution in size or number of the cells in the anterior horns. The muscle lesions were marked, particularly in the neck muscles. The fibers were of irregular size. The transverse striations were absent; the longitudinal present; a considerable increase in nuclei.

LAFFER.[26] Girl, aged 8 years. Birth normal. Soon after birth, it was noticed that the face was immobile; could hold head erect when a few months old, and sit up when 7 months; began to walk when 14 months old, but with a peculiar waddling gait. There had been slight improvement since. There was great flaccidity of joints, particularly those of the lower extremities, and muscular weakness. (This case offers differences from the other cases in the first appearance of the condition in the face. There was no note of flaccid atony in the lower extremities until she began to walk at the age of 14 months.)

ROTHMANN.[27] The first child of the mother. The mother fell on her back in the eighth month of pregnancy. Fetal movements were felt but were weak. When 14 days old the mother observed that it did not move the limbs, and thought the condition was present from birth. The child when seen at 4 months was a typical case. A badly nourished child of normal size. Skull, otherwise normal, showed closure of the large fontanel. The legs were relaxed and showed no trace of active motion. On the upper and lower legs the skin was thick, the fat abundant; the muscles could not be palpated. The legs could be moved in any direction without opposition. The skin and tendon reflexes of the legs were absent. The arms could not be actively moved. There was movement of the fingers. The head fell to one side or forward or back on the body when moved. The face, the pharynx, the tongue, the eyes, all moved normally. There was no paralysis of the sphincters. Electric stimulation procured effect only on flexors of arms. When crying the expression was normal.

Autopsy. The thymus was large for the age of 5 months. The cord was small and firm. Microscopically the cord showed extensive disappearance of the large motor ganglion cells of the anterior columns. The few motor cells which were retained were smaller than normal and showed evidences of degeneration. The absence of all fresh degeneration showed that the condition must have lasted several months. There was also a diminution of cells in Clark's columns. The white matter was entirely normal. In the vicinity of the hypoglossal nucleus there was chromatolysis and apparent beginning of the process. The investigation of the peripheral nerves of the arm and leg showed diminution in the size of the fibers, with thickening of the perineural connective tissue septa. There was no degeneration. The nerve fibers in the muscle were made out by the gold chlorid method; the end plates were not seen. Since according to the condition of the anterior horn cells only few motor fibers could be present, they must either have vanished without leaving a trace, or there must have been a regeneration in fetal life. The biceps showed increase of the connective tissue with increase

of nuclei. In the quadriceps there was infiltration of fat between the fibers with small-cell infiltration. The intercostal muscles were normal. The thymus showed an increase in the Hassall bodies and thickening of the walls of the vessels.

COLLIER AND HOLMES.[28] Child, aged 3½ years. Pregnancy and birth normal. No mention of fetal movements. Mother noticed that the child did not kick like other children, but no other peculiarity was noted until a year old, when she tried to stand him up and found that his legs doubled up under him; was never able to stand or to walk; could not himself assume a sitting position. The diaphragm and intercostals acted well. There was no local muscular wasting. Passive movements at all the joints was free, and flail-like movements of hands and fingers could be produced by shaking. In the lower extremities hypotonicity of muscles of thigh and calf. The feet could be easily touched together behind the head. Deep reflexes absent; superficial, normal. From this patient a piece of thigh muscle was taken for examination, as well as from one of the previous patients of Dr. Collier, who had died from bronchopneumonia. No mention is made of the examination of other tissues and there is no general account of the autopsy. The muscles were fixed in Zenker's and sections made. The muscles appeared very pale and infiltrated with fat. Very few spindles could be found in the more severely affected muscles. The majority of fibers were much reduced in size, and showed an average diameter not exceeding twelve microns on cross section; they were irregular in shape, the cross striation well preserved. The nuclei seemed to be largely in excess of the normal. A small number of fibers were enormously enlarged, up to 150 microns. Regressive changes were present in many of the hypertrophied fibers. There was great increase of connective tissue in the affected muscles. The muscle bundles were normal. The intermuscular nerve fibers were small. The muscle changes are the essential pathologic lesions. They may be regarded either as due to regressive changes in previously normal fibers, or as due to defective development. He gives photographs of the slides which show an almost identical condition with that seen by us, with the exception of the size of the fibers, that of the atrophic fibers being 12 microns. The autopsy description was limited to the muscles.

J. P. CROZER GRIFFITH.[29] At a meeting of the Philadelphia Pediatric Society Griffith showed a typical case in a boy about 17 months.

ASHBY.[30] Girl aged 8 years. Condition existing from birth. The patient lay in bed as if completely paralyzed. All muscles of the body, including face, were flabby and wasted; difficulty in masticating solid food; reflexes feeble; electrical reactions normal; all special senses normal. The condition gradually improved. (This case departs from the usual type in the involvement of the facial muscles and those of mastication.)[33]

SYMPTOMATOLOGY

The description of the disease first given by Oppenheim covers very well the main points in the symptomatology. All reports agree as to the flaccid paralysis, most marked in the lower extremities, and the general non-involvement of the muscles supplied by the cranial nerves. The only possible exceptions are a difficulty in deglutition in two cases, and in one an inability to close the eyes. The great flaccidity of the joints, which might be supposed from the condition of the muscles, is also generally described. No description of this can be better than that given by the mother of one of Collier's patients: "By whatever part of the body I held him up, all the rest of him hung down like so many pieces of yarn." When we consider the remaining symptomatology there is much uncertainty. Sensation in the affected parts seems on the whole to be unimpaired, but an abnormal tolerance of strong faradic currents has been

mentioned. The reflexes may or may not be present. Contractility is generally produced by the faradic current, and there is absence of the reaction of degeneration.

ETIOLOGY

There is no accurate knowledge of the onset of the disease, whether sudden or gradual. In all the descriptions it has been impossible to give any exact time so that the onset must have been gradual; possibly weakness preceding atony, and a gradual extension of the field; in some of the descriptions this is evident. Oppenheim and those following have laid weight on the congenital nature of the disease as being one of the important conditions belonging to it. Certainly this is involved in much doubt. It is true we know nothing of the time a muscle degeneration may be in progress before symptoms are produced, but if we assume that the beginning of the disease is coincident with the appearance of the flaccid paralysis, then it certainly is not usually congenital. Of all the cases, in but five it is stated that it was present at birth. An important point bearing on its congenital nature is that of the fetal movements of the child. The degree to which this is felt varies and its absence does not denote fetal paralysis. In the cases we have collected, the presence or absence of fetal movements is mentioned in ten. In these the fetal movements were felt in seven and were absent in three. The usual statements of the time after birth are vague. The time extends in one case to seven months, in another ten, in another twelve, and in one case seven years. In regard to the frequent cases in which the condition was noted from two to thirty days after birth, it does not seem probable that it could have been present from birth and escape the attention of the mother, the nurse and the physician. We have asked several obstetricians with regard to this and they have not thought it possible. The mothers who have been asked have with some heat denied the possibility, and have even regarded the question as an attempt to secure antisuffrage evidence by showing in the female gross deficiency in the powers of observation. In none of the cases has it appeared in connection with an acute infection. In four cases it is stated that it appeared after a bronchopneumonia, and after diarrhea in one. In view of the frequency of these conditions, there is evidently no relation. It is scarcely possible by symptomatology alone to make a disease entity. To that belongs first a proved etiologic factor, or in the absence of this, definite pathologic lesions.

PATHOLOGY

There have been six autopsies made on cases and in two additional cases examination of the muscles, and there is much disagreement as to the character of the lesions. In one of the autopsies by Baudouin there was diminution in number and degeneration of the anterior horn cells and absence of myelination in the nerves; in another, the case of Lere-

boulet and Baudouin, the cord and nerves were normal. In Rothmann's case there was marked involvement of the anterior horns and the nerves. In Spiller's case, in ours, and in one of Baudouin's, the cord was normal. Presumably it was also normal in Holmes' case, since he makes no mention of its examination.

There is much more unanimity in regard to the condition in the muscles. Spiller regarded this as due to imperfect development, and most descriptions mention the great diminution in size of certain fibers and the great enlargement of others. Holmes found fibers up to 150 microns in diameter, and Baudouin found fibers of 100 microns. The photograph which Holmes gives of a cross section of muscle certainly shows no such fibers and might have been made from a section of the muscle in our case. Bing found the muscle normal, though there might have been some question of a nuclear increase. Such variation in the anatomic lesions are akin to the variations in the symptomatology and are not sufficient to serve as a basis for the creation of a disease entity. Even in the case of the lesions in the muscles, there are a number of conditions which produce similar lesions, as the great atrophy of certain fibers with a normal condition, or an enlargement of others.

The condition of the thymus gland is interesting. It was found to be enlarged in Spiller's, Baudouin's, Rothmann's and our case. Whether there is any relation between the thymus and the condition is uncertain. We regret that no microscopic examination of the gland was made in our case. Spiller and Smith[31] found fibrosis, enlargement of the Hassall bodies, endothelial proliferation, and arteriosclerosis. Baudouin found sclerosis with diminution in the Hassall bodies, and Rothman enlargement of the bodies with thickening of the walls of the blood-vessels. To any one who has made many examinations of the thymus, these statements do not convey anything. There is no organ in the body which varies so enormously in size as does the thymus in children under one year. We have taken from the records of the pathologic laboratory, Harvard Medical School, the weight of the thymus in sixty autopsies on children under 1 year of age and found a variation from 1 to 26.5 gm. The average is 4.5 gm. There is no record of weight equal to that of the thymus in this case, the next highest being 26.5 gm. in a child of four months with status lymphaticus.

There is no reason to believe that the disease is an infectious one. The onset, the distribution of the lesions, and the absence in our case of any changes which might show a past infection even, all speak against this. The lesions are not focal. Neither single muscles nor single muscle groups are affected. All the muscles innervated by the spinal nerves are affected though in different degree. The disease has further never been

seen in an epidemic or in an endemic form. The reported cases are generally distributed and have become more numerous in late years because attention has been more attracted to the disease.

It seems much more evident that the disease is toxic rather than infectious and that in certain cases, at least, the action of the toxic agent is either directly on the muscle fibers or on the terminal nerves or nerve endings. It also seems probable that such a toxin is produced not in the infant but in the mother. There does not seem to be any relation between the disease and any other disturbance in the child, no relation to food or digestive disturbances. Some of the children were fed on the breast, others on the bottle; generally the children were healthy at birth. It is perfectly possible to conceive of the presence of a toxin in the blood of the mother from the action of which she would be protected by the presence of antibodies. The toxic agent would be transmitted along with the protecting antibodies through the placental circulation. After the birth of the child the action of the toxin would not be counteracted by the antibodies which are no longer received from the mother. We can conceive of such a toxin acting either on the spinal cells or on the nerves or on the muscles, or on all three tissues, of its being constantly present in the mother's blood, which would be the case in the Werding-Hoffman[32] familial type, or only temporarily present as in the cases of myatonia. It is, of course, difficult to explain under such an hypothesis why single muscle fasciculi and single fibers in a fasciculus should remain normal as in our case.

PROGNOSIS

The prognosis in these cases is doubtful. Without actual destruction of nerve cells there should be considerable capacity for regeneration, and improvement has been seen in many of the cases. We do not know, however, whether muscles so altered as these are capable of complete regeneration. The few reports of cases up to 10 years of age do not seem to give a very good prognosis. Of course much will depend on the extent of the lesions.

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BIBLIOGRAPHY

1. Oppenheim: Ueber allgemeine und localisierte Atonie der Muskulatur (Myatonie) im frühen Kindesalter, Monatschr. f. Psychiat. u. Neurol., 1900, viii, 232.

2. Muggia: Un caso di paralisi completa congenita dei quartto arte, Pediat. Napoli, March, 1903.

3. Batten: Three Cases of Myopathy, Infantile Type, Brain, 1903, p. 147.

4. Schuller: Wein. klin. Wchnschr., 1904, p. 722.

5. Spiller: General or Localized Hypotonia of the Muscles in Childhood, Bull. University of Penn., 1904, xvii.

6. Oppenheim: Ueber einen Fall von Myatonia congenita, Berl. klin. Wchnschr., 1904, p. 255.

7. Berti: Contribuzione all' atonia musculaire congenita di Oppenheim, Pediat. Napoli, 1905.

8. Kundt: Myatonia Congenita, Leipsic Dissertation, 1905.

9. Rosenberg: Ueber Myatonia Congenita, Ztschr. f. Nervenh., 1906, xxxi.

10. Iovane: Contributo clinico allo studio all' atonia musculaire congenita d'Oppenheim, Pediat. Napoli, March, 1906, p. 190.

11. Sorgenta: Due case di atonia musculaire congenita di Oppenheim, Pediat. Napoli, May, 1906.

12. Comby: Atonie musculaire congenitale, Arch. de méd. d. enf. Par., 1906, ix.

13. Cattaneo: Sulla paralisi dei neonati a sulla myatonia generalizzata di Oppenheim, La Clinique Mod., June, 1906.

14. Bing: Ueber atonische Zustände der kindlichen Musculatur, Med. Klin., 1907.

15. Tobler: Ueber congenitale Muskelatonie (Myatonia congenita), Jahrb. f. Kinderh., 1907, lxvi.

16. Variot and Devillers: Un cas d'atonie musculaire congenitale, Bull. Soc. de pédiat. de Paris, 1907, ix.

17. Comby: Atonie Musculaire congenitale, Bull. Soc. de pédiat. de Paris, 1907, ix.

18. Coombs, Carey: Congenital Hypotonia (Congenital Amyoplasia), Brit. Med. Jour., 1907, p. 1415.

19. Leclerc: Gaz. d. hôp., 1907.

20. Beaudouin: Amyotonia congenita, Semaine méd., 1907.

21. Ausset: Sur un case d'atonie musculaire congenita. Echo méd. du nord., 1908, xii.

22. Brunard: Un cas de myatonie congenital Maladie d'Oppenheim, La Clinic, 1908.

23. Collier and Wilson: Amyotonia Congenita, Brain, 1908.

24. Gastonguay: Un cas d'atonie musculaire congenitale, Maladie d'Oppenheim, Bull. méd. de Quebec, 1908, x.

25. Lereboulett and Beaudouin: Un cas de myatonie avec autopsie, Soc. méd. de hôp., 1909, xxvii.

26. Laffer: Myatonia congenita of Oppenheim with a report of case.

27. Rothmann: Ueber die anatomische Grundlage der Myatonia congenita, Monatschr. f. Psychiat. u. Neurol., 1909, xxv.

28. Collier and Holmes: Amyotonia Congenita, Proc. Roy. Soc. Med., Neurol. Sec., 1909, ii.

29. J. P. Crozer Griffith: Arch. Pediat., April, 1910.

30. Ashby: A Case of Congenital Myatonia, Arch. Pediat., May, 1910.

31. Smith, A. J.: Histological Changes Encountered in the Thymus and Elsewhere in a Case of Congenital Hypotonia, Bull. University of Penn., 1905, xviii,

32. Werding-Hoffman: Weiterer Beitrag zur Lehre von der hereditären progressiven spinalen Muskelatropie in Kindesalter, Deutsch. Ztschr. f. Nervenh., 1897, x.

33. An additional case is that reported by Beevor: A Case of Congenital Spinal Muscular Atrophy and a Case of Hemorrhage into the Spinal Cord at Birth Giving Similar Symptoms, Brain, 1902, xxv, 85.

PROGRESS IN PEDIATRICS

DISEASES OF THE CIRCULATORY SYSTEM

Congenital Heart Disease

A Review of Recent Literature

From a clinical study of fourteen cases of congenital heart disease Walker[1] draws the following conclusions: (1) By a careful examination of the physical signs in patients suffering from congenital morbus cordis, it is probable that, with the accumulation of details, such cases will be divided into clinical groups of distinctive types, and that eventually when such clinical groups have been established and the morbid conditions associated with them described, the diagnosis of one lesion from the other, and the prognosis based on it, will be possible. (2) Exclusive of other lesions, such as septal defects, there appear to be at least three clinical groups of pulmonary stenosis: I, *a*. Cases in which the signs seem to indicate a constriction in the neighborhood of the pulmonary valve; high stenosis. I, *b*. Cases in which the signs seem to indicate a constriction and incomplete fusion of the infundibulum with the body of the right ventricle; low stenosis. II. Cases in which there are evidences that the ductus arteriosus is also patent. (3) Patent ductus arteriosus may give rise to a water-hammer pulse and capillary pulsation. (4) In many cases of congenital heart disease, and more especially when there is evidence of ductus arteriosus patency, an abnormal zone of basal cardiac dulness is present. (5) There seems to be evidence that where pulmonary stenosis is accompanied by patency of the ductus arteriosus the symptomatology is less severe and life more prolonged. (6) A large percentage of cases of congenital heart disease, associated with pulmonary stenosis, give a definite history or family history of rheumatic infection, or a history of cardiac disease in other members of the family.

Goodman[2] reports a case of patent ductus arteriosus in a boy aged 14, of good mental development, apparently healthy, exhibiting no subjective symptoms of cardiac disease and showing no cyanosis or clubbing of the fingers. He considers the following points, in this case, of diagnostic importance, but cautions that too much weight should not be placed on any one sign or symptom: Of the physical signs, emphasis is laid on the bulging of the left side of the chest, visible pulsation in the second left interspace and a systolic thrill in the same area not felt elsewhere. Here is to be heard a loud, rasping, grating systolic murmur, appreciated a short distance from the heart, transmitted to the carotids, better to left than to right, and heard well in the interscapular space at the level of the spine of the scapula, and along the vertebral column; hypertrophy of the right and left ventricles with a "band-like area of dulness" along the left margin of the sternum between the second and fourth ribs; pulsus paradoxus; normal pulse tracing; paralysis of left vocal cord; Röntgen-ray confirmation of Gerhardt's dulness. Goodman has collected from the literature seventy-one cases, practically all the cases reported from 1847 to the present time, and has analyzed them from the point of view of symptoms and physical signs.

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1. Walker, R. W. S.: Clinical Observations on Congenital Heart Disease, Heart, May 10, 1911, ii, 3, 249.

2. Goodman, E. H.: Report of a Case of Patent Ductus Arteriosus Botalli with a Study of the Cases Heretofore Published, Univ. of Penn. Med. Bull., December, 1910, xxiii, 10, 509.

Z. v. Bokay[3] reports a case of transposition of the large vessels of the heart in a child 9 months old. The aorta arose from the right ventricle and the pulmonary artery from the left ventricle, making two circulatory systems whose only connection was a patent foramen ovale. The wall of the left ventricle measured 4.5 mm., the wall of the right ventricle 10 mm. Clinically there was marked cyanosis and a systolic murmur at the apex. The author has collected from the literature forty-three similar cases and tabulated them according to age, clinical symptoms and autopsy findings.

Kingsley[4] reports the case of a female infant 5 months old in which, together with other congenital deformities, a patent ductus arteriosus was found.

Weber and Dorner's[5] case of congenital pulmonary stenosis in a young man aged 29, is of especial interest because of the blood conditions. There was marked cyanosis, an absolute polycythemia and a true plethora (polyemia); that is, the amount of hemoglobin and the number of red cells per cu. mm. of blood and the amount of hemoglobin and volume of blood per 100 gm. body-weight were greatly above the normal. They believe this increase is due to increased formation in the bone-marrow. The blood-plasma was only very slightly concentrated. Orthostatic albuminuria was marked in this case, a condition not found in most cases of congenital heart disease. Bie and Maar[6] have recently reported a similar case.

Warthin[7] believes that congenital syphilis of the heart is not a rare disease. The disease rarely manifests itself in the form of a gumma, but most frequently in the form of a diffuse interstitial myocarditis due to the presence of the *Spirochæta pallida* in large numbers. The diagnostic criterion is the demonstration of spirochetes in the fibroblastic areas in the heart wall. There is no characteristic macroscopic change, so that the absence or presence of congenital cardiac syphilis can be told only by a thorough microscopic examination. A series of twelve cases is reported, nine of which occurred in infancy and childhood, but in only one of these was the diagnosis of congenital syphilis made before death. It was found to be a cause of asphyxia neonatorum and unexplained sudden death in infants and should be borne in mind as a cause of non-development and infantilism in children and young adults.

Heart-Block

Galloway and Fenton[8] report a case of Stokes-Adams disease in a boy of 18. He had repeated fainting attacks with a pulse-rate of 32 to 40 per minute. There was no cardiac hypertrophy or evidence of valvular lesions. Pulse tracings showed the case to be one of partial heart-block, the ratio of the auricular and ventricular rhythm being usually 2 to 1, occasionally 1 to 1.

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3. Von Bokay, Z.: Ueber Transposition der grossen Schlagadern des Herzens. Arch. f. Kinderh., 1911, lv, 5-6, 321.

4. Kingsley, C. R.: A Case of Congenital Deformities: Patent Ductus Botalli: Absence of Left Kidney and Chronic Peripheral Edema. Bull. Johns Hopkins Hosp., February, 1911, xxii, 239, 56.

5. Weber, F. Parkes, and Dorner, G.: A Case of Congenital Pulmonary Stenosis with Special Consideration of the Nature of the Secondary Blood Changes. Lancet. London, Jan. 21, 1911, i, 150.

6. Bie, W., and Maar, W.: Ein Fall von angeborenen Herzfehler mit Cyanose und Polyglobulie. Deutsch. Arch. f. klin. Med., 1910, xcix, 3-4, 382.

7. Warthin, A. S.: Congenital Syphilis of the Heart. Am. Jour. Med. Sc., March, 1911, cxli, 398.

8. Galloway, J., and Fenton, W. J.: Stokes-Adams Symptoms in a Lad, Aged 18. Proc. Roy. Soc. Med., London, January, 1911, iv, 3, 39.

Armstrong and Mönckeberg[9] present, respectively, the clinical and anatomic aspects of a case of heart-block in a 5-year-old boy. This case had been reported previous to the boy's death by Armstrong.[10] The patient first came under observation Aug. 3, 1909, at which time he had a high temperature and convulsions. He was first thought to have meningitis, but this was ruled out by a normal cerebrospinal fluid. The diagnosis was made from tracings of the jugular vein and radial artery which showed no relation between the auricular and ventricular systoles. Belladonna had no effect on ventricular pulse-rate. The average pulse-rate was between 40 and 50 beats per minute. The boy died July 25, 1910, in an epileptiform attack. Necropsy showed a lymphangio-endothelioma of the auriculoventricular node.

Cleveland's[11] case was a boy of 15 with attacks of unconsciousness without convulsions and a pulse-rate usually about 30 beats per minute. On one occasion the rate was counted with a stethoscope as 10 per minute. The heart was normal in size and position clinically. Autopsy showed hypertrophy of the left ventricle but no valvular disease. There was no microscopic examination of the auriculoventricular node or bundle.

Fulton, Judson and Norris[12] report three cases of heart-block in the same family, the father, 41 years old, a daughter 20 years old and an infant 22 months old. Pulse-tracings from all showed incoordination between the auricles and ventricles. They conclude that the most reasonable hypothesis is a congenital physiologic and perhaps anatomic abnormality in the auriculoventricular bundle or its blood-supply.

Two cases of heart-block in diphtheria have been recently reported. Magnus-Alsleben[13] has reported a case of complete heart-block in diphtheria in a child, aged 8 years, in which microscopic examination of the auriculoventricular bundle showed a severe parenchymatous degeneration.

Fleming and Kennedy's[14] case was a girl aged 10. On the sixth day of illness there was a marked variation in the pulse-rate between 40 and 88 per minute; on the eighth day there was evidence of cardiac dilatation; on the ninth day there was palatal paralysis; on the tenth day of the illness she died. Tracings showed the auricles and ventricles beating at different rates. The auriculoventricular node and the first part of the auriculoventricular bundle showed a well-marked acute inflammatory condition. The muscle of the auricles and ventricles showed myocarditis. The vagi showed no changes. These cases show that a slow pulse in diphtheria is not necessarily the result of inhibitory cardiac impulses.

Endocarditis, Myocarditis and Pericarditis

Poynton[15] includes tachycardia as one of rarer occurrences in the rheumatism of childhood. It occurs more frequently with mitral stenosis than with any other lesion and may be paroxysmal or persistent. Tachycardia is common when the

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9. Armstrong, H., and Mönckeberg, J. G.: Herzblock, bedingt durch primären Herztumor bei einem 5-jährigen Kinde, Deutsch. Arch. f. klin. Med., 1911, cii, 1-2, 144.

10. Armstrong, H.: A Case of Stokes-Adams Disease in a Boy Aged Five, Liverpool M.-chir. Jour., 1910, xxx, 58, 327.

11. Cleveland, A. J.: A Case of Stokes-Adams Disease in a Boy, Aged Fifteen Years, Brit. Jour. Child. Dis., May, 1911, viii, 80, 209.

12. Fulton, Z. M. K., Judson, C. F., and Norris, G. W.: Congenital Heart-Block Occurring in a Father and Two Children, One an Infant, Am. Jour. Med. Sc., September, 1910, cxl, 339.

13. Magnus-Alsleben, E.: Zur Kenntnis der vorübergehenden Ueberleitungsstörungen des Herzens, Ztschr. f. klin. Med., 1910, lxix, 82.

14. Fleming, G. B., and Kennedy, A. M.: A Case of Complete Heart-Block in Diphtheria, with an Account of Post-Mortem Findings, Heart, November, 1910, ii, 2, 77.

15. Poynton, F. J.: Some of the Rarer Occurrences in the Rheumatism of Childhood, Brit. Med. Jour., Jan. 7, 1911, i, 5.

myocardium suffers out of proportion to the valves. He has never seen a case associated with exophthalmic goiter and hesitates to ascribe early persistent tachycardia to any disturbance of the thyroid.

Wynter[16] calls attention to the fact that in pericarditis there is an absence of abdominal respiratory movements. He believes that primary thoracic disease has a share in causing suspended function of the diaphragm as well as acute abdominal conditions. When one lung or pleura is affected the influence on abdominal movement is less marked. In acute pericarditis, on the other hand, the cessation of phrenic action is bilateral. Consequently, absence of abdominal movement is as obvious as in acute abdominal disorders, although other abdominal manifestations, such as muscular rigidity and general tenderness are lacking. X-ray examination shows the diaphragm to be inert. Restriction of abdominal movement is more marked in fibrinous pericarditis than in pericarditis with effusion. It is absent in adherent pericardium. Wynter reports twelve cases in children and in adults.

Cockayne[17] examined the records of 780 cases of chorea to find out what influence the salicylates had on the cardiac lesions of the disease. Out of the 780 cases he found seventy-seven which showed, while the patients were in the hospital, clinical evidence of the onset of endocarditis, myocarditis or pericarditis and also evidence of a fresh lighting up of an acute rheumatic process in the heart. Of the seventy-seven cases thirty-nine were not treated and thirty-eight were treated with salicylates. Of the 780 cases, 355 patients were given salicylates and 425 received other treatment. If the drug had no effect the numbers showing cardiac change should be in the proportion of thirty-nine untreated to thirty-two treated with salicylates, and the actual numbers obtained are so near these that the disparity can have no significance. The statistics do not show that large doses have any more effect in preventing the progress of cardiac trouble than small ones, although the number of cases in which large doses were given was small. He concludes that the organisms of rheumatism were probably present in the myocardium, endocardium or pericardium in these cases, and the salicylates (in the doses usually given) appear to have no action in preventing their entrance into the heart, nor in stopping their further activity when once established there.

Nobécourt and Voisin[18] maintain that an accurate study of the relative cardiac dulness is of great aid in making clear the diagnosis, prognosis and treatment of heart disease in children. They computed the surface area of the heart by the formula of Potain. The product of the vertical diameter, measured in centimeters from the superior border of liver dulness to the top of the cardiac dulness, the line measured being parallel to the median line; and the horizontal diameter of the heart measured in centimeters from the junction of the right border of cardiac dulness and the upper border of the liver to the apex, this line not necessarily being horizontal; multiplied by the constant .83. They studied in all thirty-six cases. Two cases of congenital heart disease showed a formula a little above normal; two cases of adherent pericardium showed a formula a little or not at all increased. A fixed apex with a diminished area of dulness they believe to be certain evidence of adherent pericardium. From a study of twelve cases of acute cardiopathy they conclude that (1) there exists an increase of precordial dulness without any sign of endo- or pericarditis; (2) the modifications of the precordial dulness coincident with an acute endocarditis are very marked; (3) in pericarditis the modifications are still more important. In the remaining cases, twenty in number, the cardiac condition was chronic. Compensated mitral insuf-

16. Wynter, W. Essex: Absence of Abdominal Respiratory Movement as an Indication of Pericarditis, Proc. Roy. Soc. Med., February, 1911, iv, 4, 40.

17. Cockayne, E. A.: The Influence of Salicylates on the Cardiac Lesions of Chorea, Quart. Jour. Med., April, 1911, iv, 15, 336.

18. Nobécourt, P., and Voisin, R.: La Matité précordiale dans les cardiopathies Infantiles, Arch. d. mal. du Cœur, February, 1911, iv, 2, 65.

ficiency shows only a slight increase in the surface area but the onset of an acute process is quickly seen by the increased formula. The manner in which changes in this surface area of the heart would influence prognosis and treatment is evident.

McKenzie[19] states that the prognosis of pneumonia is influenced not only by chemical processes, but also by mechanical ones. Changes in the shape and size of the heart, when the vascular system is otherwise normal, may be due to extensive collapse of the pulmonary tissue and rickety deformity of the chest wall, both throwing extra work on the right ventricle. The mechanical effect of rickety deformities he explains as follows: These deformities are over one of the most expansile parts of the lung, expansion is hindered and respiration becomes chiefly diaphragmatic, the pumping action of the expanding and contracting lung is partially lost and consequently more work falls on the right ventricle.

Stoerk[20] reports a case of dextrocardia in a boy aged 11 who came to the hospital because of a left-sided paralysis. There were no cardiac symptoms except that after running he was more easily tired than other children and had palpitation, which he localized to the right of the median line. The heart showed marked mobility on change of position from one side to the other.

Arteries and Veins

Hallé and Schreiber[21] after a brief review of ten similar cases previously reported, present a case of aortic aneurism in a boy aged 5. The diagnosis was confirmed by *x*-ray examination. The etiology of the condition was absolutely unknown. The Wassermann reaction was negative.

Coombs[22] found in 51 per cent. of 100 consecutive patients between 3 and 15 years of age, a venous hum, continuous through systole and diastole, immediately below the sternoclavicular joint or joints. This murmur was accentuated at the beginning of systole and diastole, was more common on the right side, best heard when the head was retracted and usually absent in the recumbent position. It is produced in the jugular veins but it is not clear by what mechanism. Though associated with anemia it may occur in perfectly healthy children. It is not especially associated with tuberculosis or any enlargement of the intrathoracic lymph-glands and has no diagnostic value.

Among the rarer occurrences in the rheumatism of childhood Poynton[18] includes venous thrombosis. In all the cases he has seen there was severe heart disease and only two patients survived. All cases have been of the large veins of the neck and upper extremities. When the large veins of the neck are involved the sudden edema may be mistaken for parotitis. It is a question whether this thrombosis is due to a mechanical or to a rheumatic lesion.

Hamburger[23] has frequently noticed that the arteries, especially the radials and temporals, in children after the sixth or seventh year are very easily palpable. This is not due to sclerotic changes or renal disease but, he believes, to increased arterial tonus due to vasomotor influences. This arterial rigidity is most commonly found during the school age in nervous children who often complain of headache and palpitation of the heart and other symptoms of increased vasomotor irritability.

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19. McKenzie, I.: On the Interdependence of the Circulatory and Respiratory Systems, Brit. Med. Jour., April 22, 1911, i, 927.

20. Stoerk, E.: Ein Beitrag zur Frage der Dextrocardie, Mitt. d. Gesellsch. f. inn. Med. u. Kinderh., Wien, 1911, x, 2, 12.

21. Hallé, J., and Schreiber, H.: Ectasie Aortique chez un Enfant, Arch. d. mal. des enf., August, 1911, xiv, 8, 603.

22. Coombs, C.: The Venous Murmurs Heard at the Root of the Neck in Children, Brit. Jour. Child. Dis., March, 1911, viii, 87, 109.

23. Hamburger, F.: Ueber Arterienrigidität im Kindesalter, München. med. Wchnschr., Jan. 31, 1911, lviii, 5, 250.

GENITO-URINARY SYSTEM

Recent Contributions to Our Knowledge of the Diseases of the Kidney

KIDNEY METABOLISM

Frey[1] has investigated the method of urine formation by a study of the freezing point and sodium chlorid concentration in the urine as compared with blood-serum. He first determined the relations under normal conditions and then the relations under diuresis. Phloridzin produces a diuresis without widening of the vessels of the kidney, and is therefore a tubular diuresis. The resulting urine does not become more like blood-serum than before. So he concludes that the urine formation in the tubules is a secretion. When caffein or the nitrites are given, which produce a constriction and dilatation of the vessels, the resulting urine always approaches in character that of the blood-serum. This is a glomerular diuresis and he therefore concludes that the product of the glomerulus is a filtration of the blood-serum. NaCl is a filtration product. Urine formation is dependent largely on the action of the tubules by which the filtration products of the glomeruli are exchanged for other constituents. All the salts except NaCl are secreted by exchange. Always some NaCl is retained in the tissues. The concentration of the NaCl in the urine regulates the amount of water excreted.

L. d'Amato and V. Faggella[2] studied the variation in NaCl, nitrogen and water excretion under forced feeding. Rabbits with an excess of urea in the diet showed an increasing excretion of nitrogen but this excreted nitrogen never equaled the amount taken in. With this increasing excretion of N there was a distinct disturbance of the chlorin balance and great variations in the water output of the kidneys. If the rabbits were given large amounts of NaCl the excretion of that substance in the urine showed great fluctuations, but the whole amount taken into the body was disposed of in a short time. The water excretion quickly returned to normal after some fluctuation. There was a distinct tendency to accumulate N. If the NaCl was given subcutaneously the retention of water with subsequent edema was easier; but this change was only temporary. If distilled water was given the water excretion was increased, with large fluctuations, and there was a loss of N and NaCl. From these experiments he concludes that a healthy kidney can get rid of an excess of water and chlorin better than an excess of urea. He believes that the depression of function after overwork is due to temporary fatigue.

The relation of the NaCl metabolism to kidney function has been shown by the work of v. Hoesslin and Kashiwado[3] to be very complicated. They mention the fact that there may be no NaCl retention in cases of kidney injury due to high temperature and to the excretion of toxins. Where there is water retention in these conditions there may be secondary NaCl retention also, which may account for the decreased NaCl secretion often found on urinalysis. They made experiments similar to those of d'Amato and found N disturbance as well as NaCl disturbance following the subcutaneous injection of NaCl. They do not think our knowledge of the action of the vasodilators on the vessels of the kidneys is sufficiently accurate to be of any value as a basis for conclusions. They also tried experiments with a mixture of yohimbin, urethane and alcohol in addition to the nitrites. Changes in the vessels, not sufficient to show in blood-pressure, did nevertheless show in the NaCl excretion. Blood-letting and compression of the trachea were also found to influence the NaCl retention. They do not believe that any conclusion based on the theory that N and NaCl behave differently because excreted in different places is sound. This is contrary to the findings of most investigators. Karsner[4] and Frey[1] believe that water and inorganic salts

1. Frey: Deutsch. med. Wchnschr., 1911, xxxvii, 1072.
2. d'Amato and Faggella: Ztschr. f. klin. Med., 1911, lxxii, 474.
3. Von Hoesslin and Kashiwado: Deutsch. Arch. f. klin. Med., 1911, cii, 520.
4. Karsner: Jour. Am. Med. Assn., 1911, lvi, 1452.

are due to the action of the glomeruli and organic substances due to the action of the tubules.

Schlayer[5] has emphasized the importance of vascular changes in nephritis, even though the changes may not show as anatomic lesions. These always show themselves in a disturbance in water secretions—sometimes oliguria, sometimes polyuria. After a study of salt, water, iodin and sugar excretion he comes to the conclusion that the injury to the vessels does not affect the NaCl excretion. This agrees with the work of Monakow.[6] The latter author, however, does not agree that iodin and NaCl disturbances go together. He found great variation in this respect between different patients and between the same patient at different times. The N elimination is also variable and not in relation to the other elements of the urine. He would divide all cases of nephritis into groups according to their functional capacity and treat them on this basis. From a study of nine cases made during life and examined post mortem he concludes that the elimination of N is affected by the glomeruli and that NaCl and water are excreted by the tubules. If, antemortem, there was a marked disturbance of iodin excretion and no disturbance of NaCl excretion, the injury to the tubules was slight.

FUNCTION TESTS

Heitz-Boyer and Moreno[7] argue that the maximum concentration of the urine is the real test of kidney sufficiency for, since the water can be drawn from the reserves in the body, the important question is the per cent. of solid constituents. The actual amount of solids depends on the diet, but the concentration depends on the state of kidney parenchyma. A patient with nephritis fed on an excess of urea was found to eliminate a smaller per cent. of urea in his urine than a healthy individual. Ambard and Moreno[8] have worked out a very complicated formula to determine kidney sufficiency based on the facts referred to above. The proportion of urea in the blood, and the urea in the urine, together with the body weight and urine concentration, are found to bear certain definite relations in health and disease. Schlayer[5] does not believe that the urine concentration is of such great value as these authors maintain.

Geraghty and Rowntree[9] report further use of phenolsulphonephthalein in the test of kidney function. They maintain, as in previous communications, that this test is simple, accurate and valuable as an aid to prognosis and treatment. Its chief value thus far has been in surgical cases but some cases of chronic nephritis have been examined. If there is marked decrease in phthalein output, marked renal changes are present and when phthalein is excreted in very small amounts a grave prognosis should be given. Keyes[10] believes this is a valuable test as applied to surgical cases. Thomas[11] has written at length concerning the use of indigo-carmin as a test of kidney function as applied especially to surgical conditions. Roth[12] has found the method unsatisfactory except in cases of renal calculi.

TREATMENT

Vogel[13] emphasizes the importance from a therapeutic standpoint of the study of NaCl and water elimination. He gives a list of the NaCl content of the various food-stuffs. Hürter[14] also gives a carefully prepared list of foods with their protein and salt content, together with their caloric values. This article by

5. Schlayer: Deutsch. Arch. f. klin. Med., 1911, cii, 311.
6. Monakow: Deutsch. Arch. f. klin. Med., 1911, cii, 248.
7. Heitz-Boyer and Moreno: Presse méd., 1911, xix, 245.
8. Ambard and Moreno: Semaine méd., 1911, xxxi, 181.
9. Geraghty and Rowntree: Jour. Am. Med. Assn., 1911, lvii, 811.
10. Keyes: Am. Jour. Urol., 1911, vii, 125.
11. Thomas: Surg., Gyn. and Obst., 1911, xii, 345.
12. Roth: Ztschr. f. Urol., 1911, v, 439.
13. Vogel: Arch. Int. Med., 1911, vii, 602.
14. Hürter: Med. Klin., 1911, vii, 55.

Hürter is an excellent review of our present knowledge of the rationale of the treatment of acute nephritis and of the details to be employed in the carrying out of that treatment. Karsner[4] has presented the subject from the chemical side with the same cleanness and precision.

Fischer[15] has advocated a method of treatment somewhat different from the usual one based on his contention that the underlying cause of every nephritis is an abnormal production or accumulation of acid by the kidney. On this basis he would explain the abnormal cloudy swelling of the kidney and also the formation of casts. The disturbances of water secretion are due, he believes, to the effects of the acid in interfering with the normal production and loss of carbon dioxid in the parenchyma of the kidney. The change in the other elements in the urine, he believes, are due to the effect of the acid in changing the absorption properties of the kidney colloids.

The treatment of nephritis on this basis is to avoid all conditions which favor an abnormal accumulation or production of acid in the kidney. Water is not restricted. The only danger from giving water is the washing out of salts which may thus favor the action of acids. This danger is avoided by giving salts in the diet, including NaCl. The giving of alkalies is also recommended. Francis[16] also advises the use of sodium carbonate in nephritis and the use of lime water by rectum. Levenson[17] advocates the use of potassium acetate or nitrate to favor the elimination of chlorids but adds that it is of doubtful value in nephritic edema.

Bonnarnour, Imbert and Jourdan[18] and Vitry[19] advise the use of calcium chlorid as a diuretic in nephritis. It does not influence the albumin, but distinctly increases the water output.

UREMIA

Obermayer and Popper[20] contend that the presence of indican in the blood-serum is of great importance in the diagnosis of uremia. They have reviewed the literature carefully and added a number of their own cases. With the indicanemia there is also N retention and molecular contraction of the blood.

Tyson[21] advocates the more frequent use of nephrotomy in chronic nephritis and gives as the indications, permanent dropsy, uremia, anuria and large albuminuria. It should be used, however, only after medical treatment is unavailing. The operation is contraindicated in patients with valvular heart disease or albuminuric retinitis. The benefit comes from the relief of tension, with possibly some stimulation of the blood-supply between the organ and the surrounding tissue. La Rogue[22] agrees substantially with all these contentions.

Gumbel[23] points out that the beneficial results from this operation are of course only in the relief of symptoms and not in any healing of the damaged kidney. He reports a case of a girl of 6 years operated on with good results.

Zondek[24] argues that if the benefit is largely due to relief of tension, scarification would be as valuable as capsule-stripping. He found from experiments in animals that more bleeding resulted from multiple incisions of the capsule than from the ordinary operation; therefore he recommends this procedure.

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15. Fischer: Jour. Am. Med. Assn., 1911, lvii, 149.
16. Francis: Med. Herald, 1910, xxix, 133.
17. Levenson: Jour. Am. Med. Assn., 1911, lvii, 150.
18. Bonnarnour, Imbert and Jourdan: Lyon méd., 1911, cxvi, 148.
19. Vitry: Presse méd., 1911, lxi, 633.
20. Obermayer and Popper: Ztschr. f. klin. Med., 1911, lxxii, 332.
21. Tyson: Med. Rec., New York, 1911, lxxx, 57.
22. La Rogue: Virginia Med. Semi-Monthly, 1911, xv, 505.
23. Gumbel: Deutsch. med. Wchnschr., 1911, xxxvii, 594.
24. Zondeck: Berl. klin. Wchnschr., 1911, xlviii, 571.

ETIOLOGY

Fischer's[25] belief in regard to the cause of nephritis has already been mentioned. Other statements (Blumer,[25] Weitlander[26]) confirm the common belief that nephritis is usually a secondary manifestation of some infection, though cases like those reported by Marfan[27] are common in which no etiologic factor can be determined. No progress has been made in this direction.

EXOPHTHALMOS

Gordinier[28] and Mitchell[29] have both drawn attention to the presence of exophthalmos in connection with chronic nephritis—the nephritis occurring spontaneously in man or produced experimentally in animals. This is believed to be connected in some way with the presence of toxins in the blood, due to renal insufficiency, which act on the sympathetic nervous system.

BLOOD-PRESSURE

Gordon[30] found that the blood-pressure in acute nephritis in children was frequently elevated and highest in those cases which showed blood and slight edema.

ANEMIA

Pribram[31] believes that the anemia of chronic nephritis is due to overaction of the adrenals, due to stimulation by toxins retained by the diseased kidney.

URINALYSIS

Albumose can be detected by the test of Fittipaldi[32] which consists in dissolving the alcoholic precipitate of urine in 31 to 32 per cent. soda solution and adding a few drops of this to a 5 per cent. solution of equal parts of nickel sulphate and ammonia. An orange-yellow color indicates the presence of albumose. The occurrence of albumin in the urine does not interfere with the test.

To detect small quantities of albumin Glaesgen[33] suggests always using a control specimen of urine. He advocates boiling the urine after adding a few drops of 20 per cent. acetic acid as the method which is most reliable. Katzenstein[34] always uses the rays of light passed through the urine at right angles to the line of vision as a means of detecting small amounts of albumin and as a method of especial use at night. J. B. Smith[35] has called attention to a method of detecting sugar and urates by measuring the amount of heat generated in a given time after the addition of potassium permanganate; also a method of determining the total nitrogen—too complicated for clinical use. Barberio[36] gives a new test for the estimation of indican in the urine. The test consists in adding two or three drops of a 1 to 2,000 sodium nitrite solution to 5 c.c. of filtered urine. After shaking add 5 c.c. of a concentrated HCl and 2 c.c. of chloroform. The color of the urine changes from yellow to violet and of the chloroform to blue. This test is very easy and rapid.

Woodyatt and Helmholz[37] warn against the error in the use of charcoal as a clearing agent for urine because of the impurities in the charcoal.

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25. Blumer: Yale Med. Jour., 1911, xvii, 293.
26. Weitlander: Med. klin., 1911, vii, 735.
27. Marfan: Med. Press and Circ., 1910, xc, 644.
28. Gordinier: New York State Jour. Med., 1911, xi, 357.
29. Mitchell: Jour. Med. Research, 1911, xxiv, 69.
30. Gordon: Arch. of Pediat., 1911, xxviii, 343.
31. Pribram: München. med. Wchnschr., 1911, lviii, 1613.
32. Fittipaldi: Gazz. d. osp., 1911, xxxii, 518.
33. Glaesgen: München. med. Wchnschr., 1911, lviii, 1123.
34. Katzenstein: Jour. Am. Med. Assn., 1911, lvi, 662.
35. Smith, J. B.: Med. Press and Circ., 1911, xci, 9, 85, 117, 170.
36. Barberio: Policlinico, Rome, 1911, xviii, 517.
37. Woodyatt and Helmholz: Arch. Int. Med., 1911, vii, 598.

Pribram[38] reports the production in animals of hemolysins, precipitins and complement binding antibodies by the subcutaneous injection of urine. Notthofft[39] reports cases of red coloration of urine due to eating mushrooms.

Engel and Turnau,[40] Tugendreich[41] and Boschan[42] report that a black precipitate forms in the urine of breast-fed babies when the urine is boiled after the addition of a small amount of a 2 per cent. silver nitrate solution. This reaction is due to the reduction of the silver nitrate by the chlorids in the urine. It does not occur in bottle-fed babies.

Raudnitz[43] confined puppies in a small space with their own decomposing urine. The puppies showed no tendency toward any disease. He was led to make this experiment because of two infants with rachitis who lived very near a factory urinal.

Aufrecht[44] describes the technic for determining the amount of uric acid in the urine. Stephan[45] gives a slight modification of this. The test depends on titration against potassium permanganate of evaporated urine after the addition of ammonium chlorid or sulphate.

Baar[46] gives the results of many tests for bile and indican made in patients with gastro-intestinal diseases and patients after operation. All patients showing bile and indican in the urine have a lesion of the gastro-intestinal tract. In laparotomy there is no bile nor indican unless there is trauma to the intestinal wall. These observations may be used in differentiating functional disturbances of the gastro-intestinal tract and conditions with anatomic lesions.

ALBUMINURIA

Lury[47] experimented with 100 children whose urine was free from albumin, having them stand in lordosis. Only those with abnormally movable kidneys showed albumin in the urine as a result of the position. Piesen[48] agreed with these observations and found also that the common attitude of children—sitting with arms folded behind the back—was liable to induce albuminuria and he thought was injurious to the kidney. Hamill and Blackfan[49] studied the occurrence of albumin in the urine of healthy children and found that none of their cases could be explained on the postural basis. They believe the albumin to be due to a temporary overtaxation of the kidneys from the ordinary habits of life. Lüdke and Sturm[50] do not agree that the transient albumin in the urine is due to posture. They are inclined to connect it with some toxic condition and believe it may be of some value in differentiating the stages of tuberculosis. This belief is founded on the study of 140 tuberculous patients, in 102 of whom albumin was found in the urine.

COLLECTING URINE

Lawrence[51] describes a method of collecting urine from female infants. A piece of adhesive plaster is fastened securely over the genital region. Through an opening cut in this plaster a finger of an old rubber glove is inserted to the other end of which a test tube is attached.

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38. Pribram: Deutsch. Arch. f. klin. Med., 1911, cii, 457.
39. Notthafft, München. med. Wchnschr., 1911, lviii, 140.
40. Engel and Turnau: Berl. klin. Wchnschr., 1911, xlviii, 18.
41. Tugendreich: Berl. klin. Wchnschr., 1911, xlviii, 224.
42. Boschan: Berl. klin. Wchnschr., 1911, xlviii, 302.
43. Raudnitz: Jahrb. f. Kinderh., 1911, lxxiii, 259.
44. Aufrecht: Berl. klin. Wchnschr., 1911, xlviii, 627.
45. Stephan: Berl. klin. Wchnschr., 1911, xlviii, 897.
46. Baar: Northwest Med., 1911, iii, 123.
47. Lury: Jahrb. f. Kinderh., 1910, lxii, 705.
48. Piesen: Wien. klin. Wchnschr., 1911, xxiv, 12.
49. Hamill and Blackfan: Am. Jour. Dis. Child., 1911, i, 139.
50. Lüdke and Sturm: München. med. Wchnschr., 1911, lviii, 993.
51. Lawrence: Boston Med. and Surg. Jour., 1911, clxiv, 309.

NOTE.—Other articles on the subject of nephritis are given below. These have not been quoted because they either contain nothing new or nothing with particular reference to pediatrics. No articles published earlier than January 1, 1911, have been included in this abstract.

Zorkendorfer: Wien. klin. Wchnschr., 1911, xxiv, 159.
Rosenthal: Deutsch. med. Wchnschr., 1911, xxxvii, 923.
Beiheig: Deutsch. Arch. f. klin. Med., 1911, cii, 507.
Goodman: New York Med. Jour., 1911, xciii, 777.
Fuhs and Lintz: Jour. Am. Med. Assn., 1911, lvi, 1882.
Pechstein: Ztschr. f. Kinderh., 1911, i, 356.
Fenner: New Orleans Med. and Surg. Jour., 1911, lxiii, 499.
Tirard: Clin. Jour., 1911, xxxvii, 401.
Smith, F. J.: Clin. Jour., 1911, xxxviii, 17.
Beard: Kentucky Med. Jour., 1911, ix, 120.
Thompson: Kentucky Med. Jour., 1911, ix, 115.
Autenreith and Müller: München. med. Wchnschr., 1911, lviii, 899.
Katz and Lichtenstern: Wien. klin. Wchnschr., 1911, xxiv, 811.
Nellis: New York State Jour. Med., 1911, xi, 185.
Schippers: Deutsch. Arch. f. klin. Med., 1911, ci, 543.
Moraczewski: Arch. f. Verdauungskr., 1911, xvii, 23.
Ronot: Lyon Chir., 1911, v, 615.
Marinacci: Policlinico, Rome, 1911, xviii, 145.
Pflanz: Wien. klin. Wchnschr., 1911, xxiv, 345.
Schenck: Surg., Gyn. and Obst., 1911, xiii, 68.
Simon: Ztschr. f. Kinderh., 1911, ii, 1.
Schulz: Deutsch. Arch. f. klin. Med., 1911, cii, 1.

RICHARD M. SMITH.

METABOLISM AND NUTRITION

The Rôle of the Carbohydrates in Creatin-Creatinin Metabolism

(*Lafayette B. Mendel and William C. Rose: Jour. Biol. Chem., 1911, x, 213*)

Two fundamental facts are emphasized by the experiments of Mendel and Rose: (1) An increase in the elimination of total creatinin (i. e., creatin plus creatinin) is always accompanied by an increase in the output of total nitrogen; and (2) carbohydrates, in contrast to the other food-stuffs, are capable of preventing the excretion of creatin and are therefore indispensable for normal creatin-creatinin metabolism. They found that the excretion of creatin induced by starvation, is inhibited in rabbits by feeding a diet of carbohydrates absolutely free from proteins and fats. When the carbohydrates are given in liberal amounts, creatin entirely disappears from the urine. The creatin elimination is not reduced by feeding a diet of fat alone, or by a diet of fat and protein. Experimental interference with carbohydrate metabolism leads to the elimination of creatin. After phloridzin diabetes which depletes the store of carbohydrates and during phosphorus poisoning, which disturbs the glycogenic functions, the output of creatin in dogs is decidedly increased. An increase in the output of creatin plus creatinin (total creatinin), is always accompanied by an increase in total nitrogen elimination. This parellelism of total creatinin and total nitrogen outputs in inanition and with nitrogen-free diets is ascribed to a common source, namely, true tissue or endogenous metabolism. The metabolism of exogenous or reserve proteins is not accompanied by the production of creatin or creatinin. The intimate relation of creatin excretion (or the failure of conversion into creatinin) to carbohydrate metabolism, is discussed in detail.

Excretion of Creatin in Infancy and Childhood

(*William C. Rose: Jour. Biol. Chem., 1911, x, 265*)

In view of the observations that creatin is a normal constituent of the urine of sucklings, Rose attempted to determine the age at which this product disappeared. Thirty-nine specimens of urine from children of different ages were analyzed. With the exception of two cases, creatin was present in all specimens from children under fifteen years of age. A boy of ten and a girl of thirteen failed to have creatin in their urines. No progressive decrease in the percentage of the total creatinin in the form of creatin coincident with increase in age is apparent; nor is the percentage of creatin constant for the same individual. For instance, one specimen obtained from a child of five years contained 24.2 per cent. of the total creatinin in the form of creatin, while a second sample from the same child a few days later, contained 79.2 per cent. of the total creatinin as creatin. It was impossible to obtain information as to the amount and kind of food eaten by the children. Most of the specimens were obtained from the city orphan homes or from private families, and the subjects of the experiments were probably ingesting more or less meat. It is possible, therefore, that the oxidation or conversion of creatin into creatinin may be difficult for young individuals to accomplish and in this case the creatin of the urine may, in part, represent ingested creatin; or the glycogenic functions may be imperfectly developed and the store of carbohydrates be insufficient to exert its regulatory influence over metabolism during childhood.

ACUTE INFECTIOUS DISEASES

Poliomyelitis

(*H. W. Hill: Tr. A. M. A., Sec. Prev. Med., 1910*)

In a statistical study of poliomyelitis in Minnesota by Hill, including cases that showed no paralysis, the maximum number available for his purposes was 333, which he estimates as something more than one-third of the total number occurring in the state. The majority of the cases occurred in the cities of St. Paul, St. Peter, and one or two other towns. Of the epidemiologic points, abortive cases, contagiousness, and mortality are the chief, and to these he gives the most attention. He admits certain shortcomings in his studies but finds, so far as the figures elsewhere are available, that they generally correspond with his own. As regards contagion, he does not find evidence that direct transmission of the disease from one person to another occurs with sufficient frequency to be of great importance. Dust, he believes, is an element of serious consequence and explains the high rural typical cases, and the spread by abortive cases, he thinks, would be even less probable. The same would also be true of carriers of incidence in children and in males at all ages. No other infectious disease is so influenced by dust-laying rainfall, and this suggests a possibility in the treatment of epidemics. Horses, especially farm horses, associate together on market days, etc., as much as their owners, and a disease clinically like poliomyelitis has existed in colts in Minnesota for some years and has been observed, though not recognized, by veterinarians all over the state and also in North Dakota. The intestinal discharges in horses are almost ubiquitous in street dust and also on country roads, and in the neighborhoods of isolated farm houses. They are sufficiently massive to protect imbedded organisms from direct sunlight and drying, yet pulverize readily, especially under heavy traffic, and may be easily blown about or tracked into houses, particularly in rural communities. It seems to him impossible that the infecting agent can be derived from the discharges of human beings, as in that part of the country they are not mixed with the ordinary dust. While in the South this is more likely, poliomyelitis has not been especially prevalent there. Hill offers this as a working hypothesis for further investigation. Numerous tables accompany the article, covering nearly all the conditions and relations of the disease.

TUBERCULOSIS AND SYPHILIS

Inherited Syphilis

(C. S. Bull: Paper prepared for but not read in Sect. on Opht. A. M. A., 1910)

C. S. Bull, New York, calls special attention to the early recognition of the stigmata of hereditary syphilis in infants and very young children. One of the greatest of social dangers is the high rate of infant mortality in the children of syphilitic parents, but a greater one is the disastrous one of heredity in those who live to maturity. In many cases of inherited ocular syphilis the lesions are so ill defined as to be unrecognizable except by the expert observer. Hence the examination should begin with the new-born infant and should be repeated at brief intervals through early childhood to youth. It is a mistake to suppose that congenital syphilitic lesions of the eye run a mild course, and he points out how lesions of the uveal tract frequently escape casual observation, though they can usually be recognized with care, because at this early age a coexisting keratitis is rare. The prognosis as to vision is largely influenced by the coexistence of other ocular stigmata. As most of these children die early, proper tests of vision often cannot be made. When the disease occurs later in child life, he is inclined to think the retina suffers less, but if retinitis or optic neuritis occur the end is, in his experience, partial or complete atrophy. He has noted the coincidence of interstitial keratitis and a vertically oval cornea occurring frequently in these cases for years, and Fuchs has recently called attention to it (*Ophthalmic Rev.*, September, 1909). If such malformation exists careful scrutiny will often reveal faint traces of former interstitial keratitis. Taken alone, however, it cannot be considered as absolute proof of inherited syphilis. As he is speaking of young children before the eruption of the permanent teeth, the dental stigmata cannot give much assistance, but the ears should be carefully examined. Pain, inflammation or discharge from the ears in infancy will often reveal scars of early trouble. If these are not found the hearing should be tested for functional disturbance, but much cannot be expected from these tests. There is a variety of aural trouble without appreciable lesion which is known to be due to inherited syphilis. This is the *surdite foudroyante* characterized by a sudden invasion, rapidity and severity of course and ending in a total loss of hearing in a few days or hours. Naturally from this occurring in early childhood there are defects in speech varying in degree to actual mutism. Facial stigmata are often accompanying the ocular or aural symptoms, and there are certain phenomena of first dentition strongly suggestive of inherited syphilis, such as very small size of the incisor teeth and the persistence and permanence of the first teeth beyond the usual period. In conclusion, he quotes Fournier's therapeutic deduction as to the necessity of specific treatment of the child or parents when the stigmata are present, and he is inclined to add to them a recommendation of sterilization of parents producing children with these stigmata.